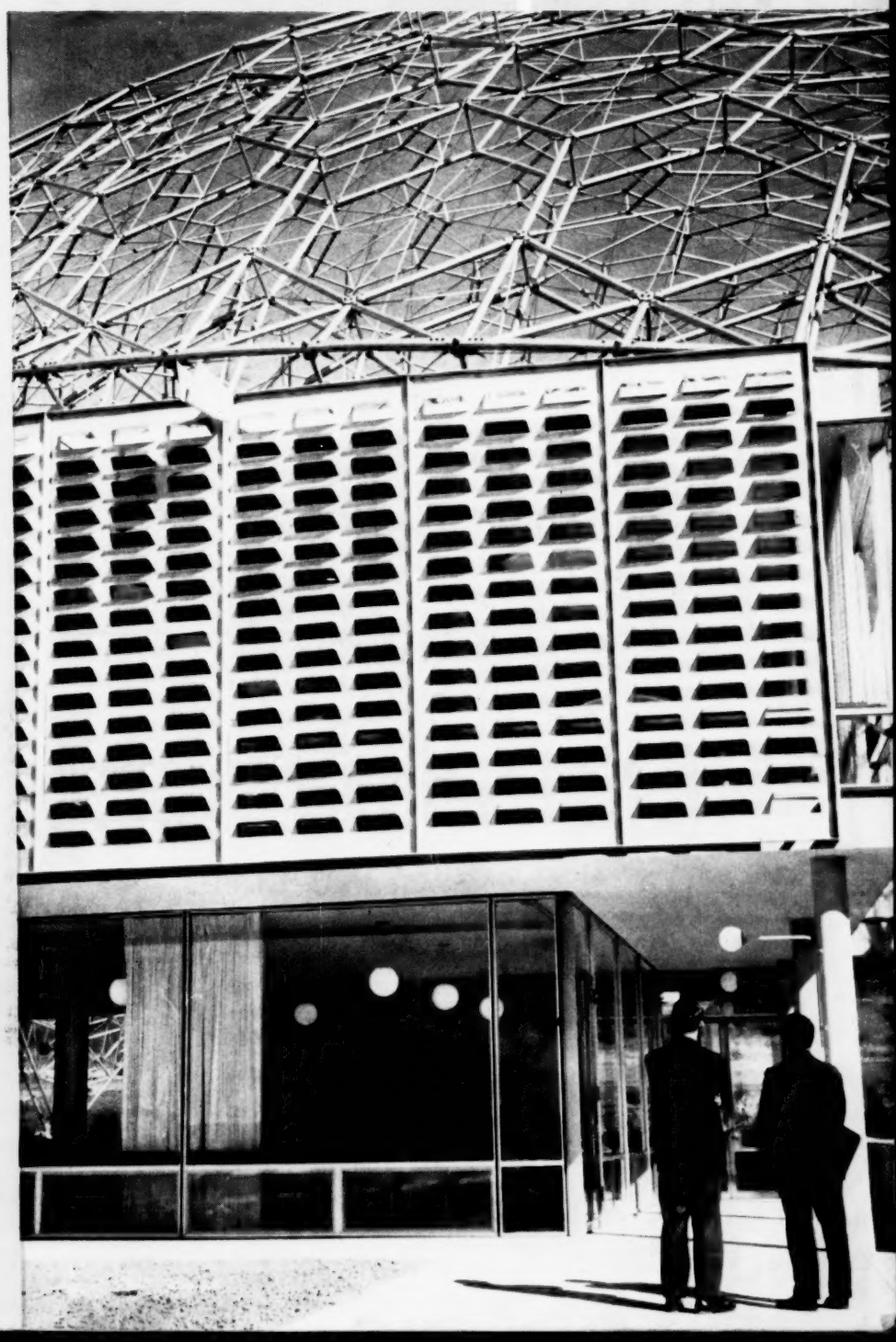
AIR CONDITIONING HEATING AND VENTILATING

MARCH 1960

For the Engineer
Engaged in DESIGN
APPLICATION
ESTIMATING
SPECIFICATION
and LAYOUT

Object of admiration seems to be the stainless steel sunshade on the new headquarters building of American Society for Metals, in Metals Park, Novelty, Ohio. Details on page 74.



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ASME PRESSURE RELIEF VALVES

Full selection of high capacity valves provides low cost protection

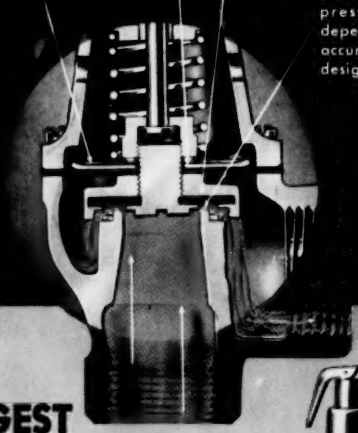
Watts No. 740 Series are especially designed for hot water space heating boilers. They have extremely high discharge capacities because of their large internal flow areas . . . making them the ideal, economical choice for boilers which previously required larger size valves for adequate protection. The ¾" size, for example, rated at 895,000 BTU HR at 30 lbs., approximates and in some cases exceeds the ratings of many 1" valves. This wide range of relieving capacities provides a much lower BTU per thousand cost, lets you size a single valve over a variety of boilers, and simplifies your stocking problems. Pressure range from 30 to 75 lbs.

Water Seal — Provides precise alignment of sent to disc and eliminates need of hazardous mechanical guides which can stick or freeze a valve shut from lime or corrosion. Seal also protects spring working parts from water or steam during relief.

Double-Safe Design — No mechanical guides — not diaphragm operated.

Stickage-free — Disc-to-Metal-Seating. Heat resisting, stickage-proof silicone disc material.

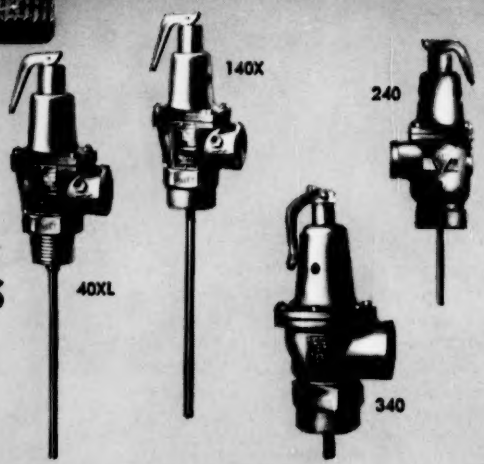
Pop Action Operation — Pressure exerted directly against disc pops valve wide open for steam relief. Full discharge rate reached immediately at the set opening pressure, and does not depend on further pressure accumulation as in some other designs.



Be sure . . . Use

Protection and Control Specialties

BIGGEST CHOICE IN ASME RATED T & P RELIEF VALVES FOR HOT WATER SUPPLY SYSTEMS



Watts No. 40-140-240-340 Series automatic reseating temperature and pressure relief valves are pressure steam rated by ASME and are available in sizes ¾" to 2" inclusive. The 40-140-240 Series are listed by AGA, having been tested and rated under the new American Standard ASA Z21.22-1958. Their construction includes the same pop type action seat and disc found in the No. 740 Series. Result: You get both ASME steam rated pressure relief and AGA steam rated temperature relief *in a single valve* — the *most complete protection* for hot water supply systems.

Where separate installation of safety devices is preferred, use Watts No. 174A Series ASME pressure-only relief valves in sizes ¾" to 2". Pressure range 75 lbs. to 160 lbs.

Watts Regulator Company, Lawrence, Massachusetts

How Much Steam Should a Steam Trap Trap?

. . . some answers to commonly asked questions about the primary job of a steam trap

You don't need a doctor's degree in thermodynamics to answer the question at the top of this page. Naturally, a steam trap should trap *all* the steam.

Unfortunately for you, the problem isn't quite that simple. After all, a shut off valve would trap all the steam . . . and condensate, and air, and carbon dioxide as well.

So we'd better amend the answer to the question this way: A steam trap should trap *all* the steam but *must* remove condensate, air and carbon dioxide as rapidly as they accumulate.

With this established, let's take a closer look at what's involved:

A Steam Trap Should Trap All The Steam

If you've had experience with several different makes of traps, you already know that some trap steam better than others. The operating principle of the trap is what makes the difference. We like to talk about it because Armstrong traps are designed so that no steam can get to the orifice. The valve is always water sealed. Result: *More efficient steam utilization, lower fuel costs.*

A Steam Trap Should Remove Condensate

All traps remove condensate—after a fashion. For maximum efficiency in the unit being drained, though, the trick is to get it out without waiting for it to cool and without leaking steam.

Armstrong's water sealed valve takes care of steam leakage. The inverted bucket operating principle opens the trap for water regardless of its temperature. This means you get the condensate out as quickly as it accumulates. Result: *Higher temperatures and better heat transfer in steam heated units.*

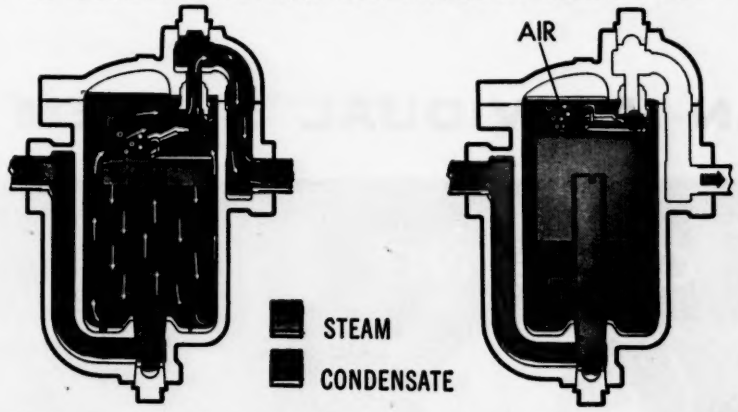
A Steam Trap Should Remove Air and CO_2

Part and parcel of the condensate removal problem is removal of air as well as oxygen and carbon dioxide—two real troublemakers. Air tends to reduce operating temperatures and interfere with heat transfer. CO_2 goes into solution to form corrosive carbonic acid which, for example, can eat unit heater tubes. O_2 aggravates the situation. Believe it or not, but all traps don't properly remove air and CO_2.

By now, you've probably guessed that Armstrong traps *do* remove air and CO_2. Armstrong design (see illustration) provides continuous venting of air and CO_2. By opening suddenly, the Armstrong trap creates a momentary pressure drop to "pump" the air down to be vented. Result: *Higher temperatures, faster heat-up, better heat transfer and reduced corrosion.*

Note: When required, specially sized air vents are furnished. For fast heat-up of low pressure on-and-off units, Armstrong provides open float and thermostatic air vent traps.

HERE'S THE STEAM TRAP DESIGN THAT GETS RID OF CONDENSATE AND AIR WITHOUT STEAM LOSS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

What's the Final Answer?

Summing it all up, you'll get the best service from steam heated units that are equipped with traps designed to trap *all* the steam and remove air and condensate as quickly as it accumulates. In our prejudiced viewpoint, this means Armstrong traps. More important are the several thousand users of Armstrong traps who have proved the point.

Before you make up your mind, though, consider the minimum maintenance requirements of Armstrong traps . . . and the convenient assistance your local Armstrong Representative provides. These are important plus values.

Put Up or Shut Up

We're so confident that we "put up". Armstrong traps are unconditionally guaranteed to satisfy. So you can find out for yourself with practically no risk. If you're not completely satisfied with the way they do their job, you can get your money back.

* * *

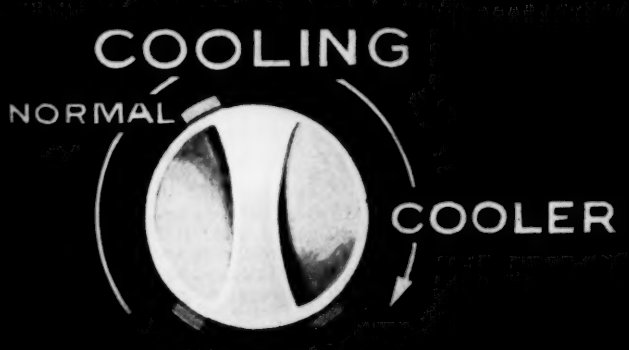
The 44-page Armstrong Steam Trap book goes into greater detail on these and other Armstrong features. It also discusses trap selection, installation and maintenance. Ask your Armstrong Representative for a copy or write

Armstrong Machine Works
8463 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

See our catalog in Sweet's Plant Engineering File

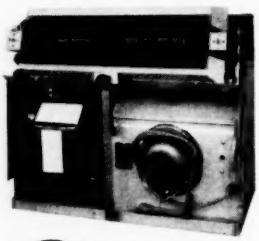
AN INDIVIDUAL SYSTEM FOR HEATING



AND COOLING IN EVERY SUITE OR ROOM

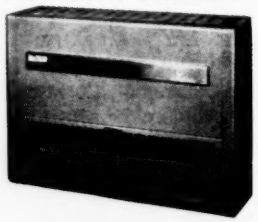
Conventional year-round air conditioners require costly central systems for the cooling cycle. Not so with the Webster Newport. Each Webster Newport has a *complete* system for both heating *and* cooling built right into it. The turn of a knob gives instant control of heating or cooling at any time—day or night, summer or winter—as varying comfort conditions require. One room—or suite of rooms—can be heated while another is being cooled . . . you—or your guests—can control the climate in *every* room equipped with this revolutionary development in air conditioning.

Installation of these attractive in-wall units can also be done a room at a time —without interrupting guest service. Air-conditioning of the entire motel can be staged to meet budget limitations—at as much as *30%* savings over a central system. Webster Newports are designed to connect readily to existing heating systems, or—with the new all-electric model—to tie in with electrical circuiting. Let a Warren Webster man show you other specific advantages of Webster's new concept of year-round heating and cooling for hotels and motels.



COOLING BY CHRYSLER AIRTEMP

EQUIPPED WITH CHRYSLER'S HEAVY-DUTY COMMERCIAL COOLING CHASSIS



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HEATING • COOLING

CAMDEN 5, NEW JERSEY

AIR CONDITIONING HEATING AND VENTILATING

Volume 57, Number 3 **March, 1960**

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HIGH SPOTS

Installation story of the month: Starting on page 96 of this issue is a review of the air conditioning and distribution features of the unique new Union Carbide skyscraper in New York. An ingenious air distribution system was devised by Syska & Hennessy engineers in response to the owner's requirement that all partitions could be reerected at any point every 2½ ft in an east-west direction and every 5 ft in a north-south direction without disturbing ducts, diffusers, or lighting fixtures and without the necessity of access to the suspended ceiling.

A consulting engineer may be reluctant to recommend to his client a heat pump system if the engineering time is appreciably greater than that required for designing of a conventional cooling system, M. J. Wilson, sales manager of commercial equipment, Unitary Division, Carrier Corporation, told a symposium at the Winter General Meeting of the American Institute of Electrical Engineers in New York. Therefore, equipment manufacturrs must make available to the professional engineers much more information on system design and equipment performance so they can design heat pump cycles without an undue penalty on engineering costs, he said.

However, Mr. Wilson feels that the acceptance of heat pumps as a practical and economical method of heating and cooling is encouraging. He believes that we are on the threshold of its general and widespread acceptance.

Air-Conditioning and Refrigeration Institute, Washington, D.C., will hold its 1960 Annual Meeting at the Hollywood Beach, Fla., Hotel November 18 through 22, it was announced by Rudy Berg, president of the trade association. Previous annual meetings had been held in May.

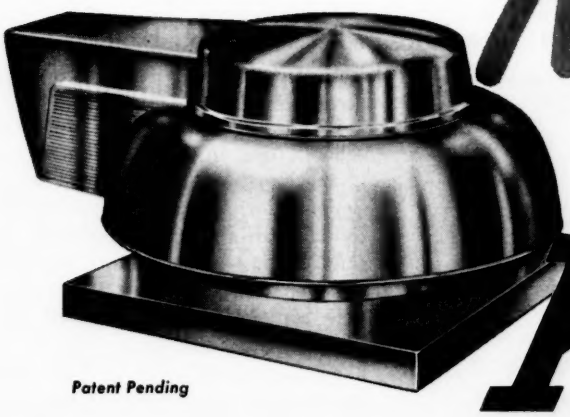
The 12th Exposition of the Air-Conditioning and Refrigeration Industry will be held in Los Angeles, California, on February 12 through 15, 1962. In announcing the place and dates for the next ARI show, H. F. Spoehrer, chairman of the Institute's Show Policy Committee, said: "Our decision to move the 1962 show to the West Coast is in recognition of the tremendous population and industrial growth of that area, its increasing importance as a major market for the products of our industry, and a desire to make it possible for many people to attend the ARI show who have not found it convenient, or possible, to travel to Chicago or Atlantic City. Moving the dates to the early part of the year will better serve the purpose of introducing new models, and will at the same time take the show out of competition with other major shows in the same calendar year."

The 13th Exposition of the Industry has been scheduled for Chicago in February 1964, with the following show to be held in the Southwest or possibly in the East in February 1966.

A one-day program on Air Cleaning and Purification in Buildings will be included in the Building Research Institute Spring Conferences scheduled for April 5-7 at New York City's Statler-Hilton Hotel. The air cleaning program is being organized under the supervision of John E. Haines, vice-president of Minneapolis-Honeywell Regulator Company.

Data on maintenance costs for different types of buildings are being gathered by BRI's Building Operation and Maintenance Study Group. The data will form the basis of its program at the Spring Conferences. Four separate subcommittees, under the direction of Chairman Howard E. Phillips of American Telephone and Telegraph Company, are circulating questionnaires designed to produce figures on maintenance costs for certain activities in four different types of buildings: (1) commercial office buildings, (2) industrial buildings, (3) hospitals, schools, and other institutional buildings, (4) residential buildings, single and multi-family.

NEW!



Patent Pending

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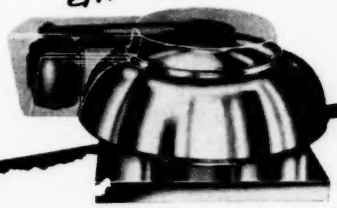

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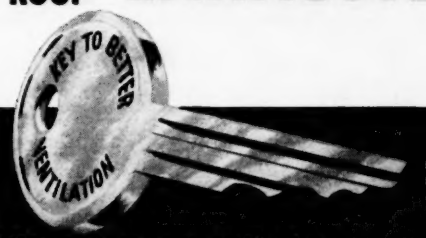

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- Built-in bird guards.
- 70 models in a capacity range from 725 to 27,000 cfm.

Full details and specifications on Jenn-Air KEY LINE Exhausters are contained in two new four-page bulletins. Bulletin 60-CK covers centrifugal models; Bulletin 60-AK axial. Write for your copies today.

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Member Air Moving and Conditioning Association (AMCA)

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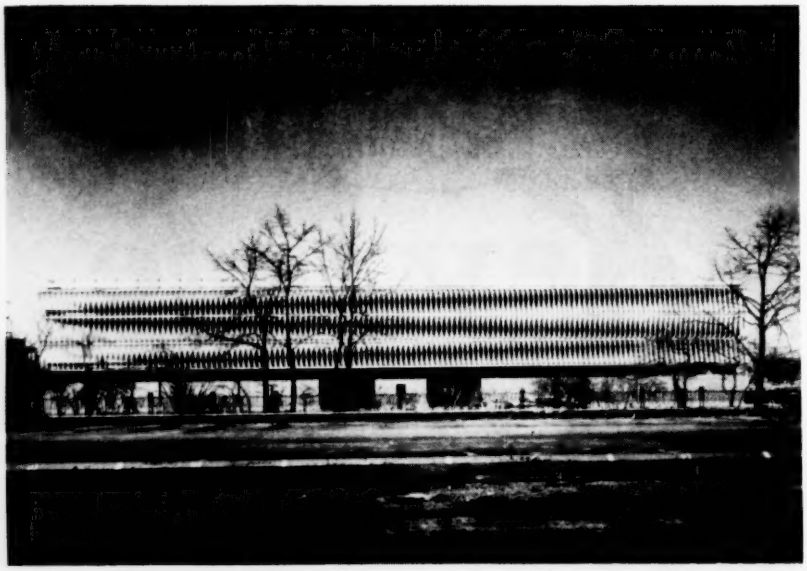
LEADER IN FUNCTIONAL IMAGINEERING

NEWS OF THE MONTH

Parking Garage Selected for Exhibit in London



Albert Kahn Associated Architects and Engineers, Detroit, have been notified that the unique parking structure which they recently designed for the Henry Ford Hospital in Detroit has been selected for exhibition at the Institute of Civil Engineers in London, England, March 17 to 27.

This exhibition is devoted to outstanding parking structures of world-wide significance and is sponsored by the Cement and Concrete Association of Great Britain in conjunction with the allied Reinforced Concrete Association and their Prestressed Concrete Development Group. Purpose of the exhibition is to demonstrate concrete as an effective means of architectural expression and to stress the unique position it holds in all forms of architecture and construction.

The garage is a four-story, split-level, brick and concrete park-it-yourself structure providing space for 870 automobiles. Erected at a square foot cost of $3.70, the unusual structure ranks as the lowest cost of its kind in the Detroit area.

SPECIFICATIONS INSTITUTE PLANS TECHNICAL CONVENTION

The theme of the Fourth Annual Convention of Construction Specifications Institute, Washington, D.C., will be technical, concentrating on the building material aspects of specifications and better methods in preparation of specifications. The 1960 convention will be held in Rickey's Studio Inn, Palo Alto, Calif., thirty-five miles from San Francisco, April 25-27. About 500 are expected.

The CSI affair follows the annual convention of the American Institute of Architects to be held in San Francisco, April 18-23.

Voting members of the Institute are individuals concerned professionally with specifications and documents used in connection with design, construction, maintenance, and equipment for construction projects; that is, architects, professional engineers, teachers and research workers in architectural and engineering fields, representatives of architects and engineers who are supervising construction projects, building maintenance engineers, and others.

MORE DATA SHOW ECONOMY OF AIR CONDITIONED SCHOOL

Construction plans for two schools, one in the South and one in the North, were cited by Carrier Corporation as proof that educational plants designed around air conditioning cost no more and can be even less expensive than those with conventional heating and ventilating systems.

A new 2,200-pupil junior-senior high school being built in Abilene, Tex., is priced at $11 per sq ft, exclusive of land and furniture. F. Ware Clary Junior High School, in Syracuse, N. Y., will cost $16 per sq ft. The figures in both cases include the investment in air conditioning equipment, and are equal to or below the average for non-air conditioning equipment, and are equal to or below the average for non-air conditioned schools in the same geographic locations, the company stated. Carrier will supply air conditioning equipment for the two schools.

School Called Bargain

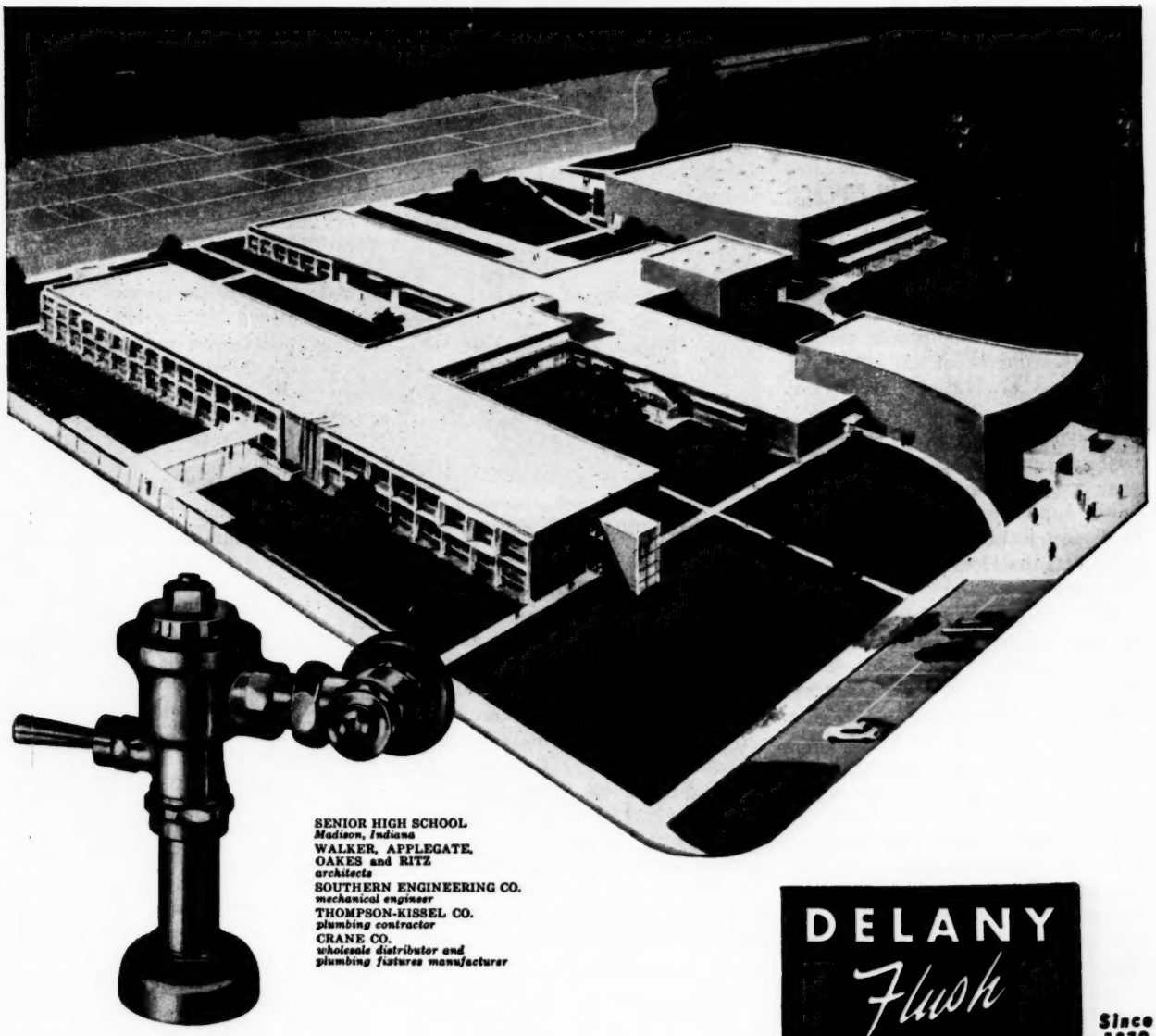
The Syracuse Department of Engineering has called Clary School one of its greatest "bargains." Dr. Paul A. Miller, Superintendent of Schools for Syracuse, said that with the cost of air conditioning included, a net saving of $54,500 will be achieved by building compactly instead of erecting a school with long classroom wings. The only purpose of wings, he added, is cross-ventilation. The need for a constant supply of fresh air can be better served by an air conditioning system which will clean it and control the temperature, humidity and circulation.

The Clary School design calls for two halves of simple rectangular shape connected by a covered passageway. One will contain 31 classrooms surrounded by an air conditioned corridor to minimize

(Continued on page 8)

And in Indiana — A FUTURE OF FAULTLESS SERVICE

The residents of the Indiana-Kentucky border area served by this handsomely sited and nicely equipped $2,000,000 educational plant can well be proud of their investment. Designed for a future enrollment of 1,200 pupils, the new Madison Senior High School . . . a COYNE & DELANY installation . . . contains 26 class rooms plus science, commercial and food laboratories. Featured are such facilities as a band room, a radio station, a complete library, a main gymnasium seating 6,000, a separate girls' gymnasium, and a 1,000 seat auditorium. The local taxpayers can also find satisfaction in the selection here of DELANY diaphragm type flush valves which will provide optimum performance at minimized maintenance cost for many years to come. DELANY superiority in design allows continuous on-the-job savings and continues to make DELANY—"the fastest growing name in flush valves!"



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SCHOOL AIR CONDITIONING

(Continued from page 6)

heating and cooling losses by transmission through outside walls. The other half will consist of a 750-seat auditorium, a gymnasium, vocational shops, a cafeteria and administrative offices.

Abilene Junior-Senior School, the city's third and largest air conditioned school, will resemble a college campus. There are to be nine separate buildings, all generally rectangular in shape. They will include: academic (30 classrooms), science, fine arts, library, cafeteria, administration, shop, boys' gym and girls' gym. The first seven will be air conditioned year-round. It will be possible to divert cooling to the boys' gym for evening events.

ELECTRIC HEATING SHOW THIS MONTH IN CHICAGO

The first National Electric House Heating Exposition, scheduled for March 21, 22, and 23 in the Sherman Hotel, Chicago, Ill., is expected to attract over 3,000 people, according to estimates of the Planning Committee of National Electrical Manufacturers Assn., New York.

A symposium will be conducted with key spots on the program shared by leading manufacturers, power suppliers, electrical distributors, electrical contractors, bankers, architects, builders and representatives of Underwriters' Laboratories.

Subjects will include discussions on new insulation techniques, heat losses, electric heating promotions, distribution of electric heating equipment, interpretations of the National Electrical Code for electric heating installations, unit heaters vs. central systems, standards, sales problems and opportunities, rate schedules, sales training programs for contractors and distributors, electric heating installations as viewed by investment bankers and mortgage firms, applications of electric heating equipment in different parts of the country and in various types of buildings, and a report on the future of the industry.

The Exposition is open only to representatives of the trade.

SEA WATER DISTILLATION BEGINS

The first general purpose sea water conversion plant on the Pacific Coast has been placed in operation by Southern California Edison Company at its steam electric plant on Mandalay Beach near Oxnard, Calif.

The first official taste of the newly distilled water was sampled by W. L. Chadwick, Southern California Edison vice president. Miss Merlene Wilson, station secretary, is shown in photo drawing the first glassful. Nature put on her own distillation show at the same time —hence the umbrella.

100,000 Gallons per Day

World-wide interest has been expressed in the California project not only because it employs a new distillation principle but also because it will be the subject of an intensive three-year research program. The 100,000 gallon a day unit was designed, engineered and manufactured by Cleaver-Brooks Special Products, Waukesha, Wis.

Edison officials said the unit will be utilized to search for a more economical method of extracting potable water from the sea by distillation. This plant, they said, is the first of its kind in the country to be used in conjunction with an existing steam electric station.

According to Cleaver-Brooks officials, the 26-stage flash evaporator is believed to be the world's longest. The main component measures over 70 feet long and weighs 40 tons. The entire unit used over eight miles of aluminum brass tubing and nearly 50 tons of steel sheet and plate.

10,000,000 Gallons Some Day

Experience and data derived from experiments with this pilot plant are expected to provide technical and cost information leading to the eventual construction of saline water plants with capacities of five to ten million gallons a day.

Although Edison's saline water converter will have only a daily output of 100,000 gallons, it has excited interest because the opportunities it affords for use of waste and lower grade heat. It utilizes steam which has passed through the station's turbine and is extracted for use in the evaporator plant.

(More news on page 10)

COURSE ON NOISE REDUCTION AGAIN AT MIT THIS SUMMER

The Massachusetts Institute of Technology, Cambridge, will again offer a special summer program on Noise Reduction from Monday, August 22, through Friday, September 2, 1960.

This two-week program will be under the direction of Dr. Leo L. Beranek, Department of Electrical Engineering, assisted by other M.I.T. faculty members and industrial engineers. The program will be taught on a case history and problem solving basis with a minimum of formal lectures.

The program is directed toward the engineer who has been assigned a noise problem for solution. The first week's topics include behavior of sound waves, decibels, selection and use of instrumentation and sound in enclosures. The second week's subjects include structures and materials for absorption and attenuation of sound, mufflers, criteria for noise and vibration control and case histories. Students must attend both weeks. In addition to the class instruction there will be exhibits, a field trip, and entertainment features.

In laboratories, libraries and luxury liners...

Delicate experiments in today's research laboratories often require precise control of temperatures and humidity. Air-conditioning plays an important role in modern research, protecting equipment from atmospheric variations and helping scientists work in top form.

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FIRST PLASTIC SEWER MAIN INSTALLED IN NEEDHAM, MASS.

The first 8-inch plastic sewer main in the United States has been installed in Needham, Mass. Additionally, all house connections were made with plastic pipe, including solvent-welded wye connections to the main.

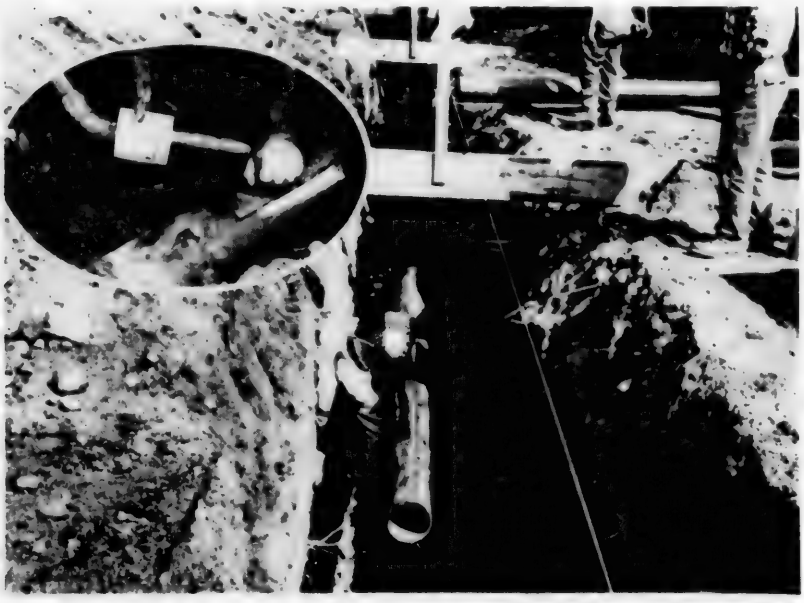
Commenting on the installation, E. A. Symonds, superintendent of sewers for Needham, said, "We have here an excellent test of the performance of a completely plastic sewer system from house drains to manholes. And having had an opportunity to evaluate the purported advantages of plastic sewers, with respect to control of infiltration and root intrusion, we are completely satisfied with the results."

Plastic pipe for the Needham sewage project was furnished by the Evanite Plastic Co., Carrollton, Ohio, a Division of the Evans Pipe Co., Uhrichsville, Ohio.

The job consisted of 300 ft of 8-inch main and 150 ft of 4-inch house connection pipe in 15-ft lengths. Although pipe can be furnished in any desired length, practical considerations of handling from yard to job site and the limitation on the total length of ditch to be opened at any given time, made the 15-ft lengths the desirable maximum length for this particular service condition.

Laying of the pipe presented no special problem even though there was considerable ground water present. A generous amount of washed stone, ranging in sizes from ½ to ¾ inches, was used as a bed, and the stone was banked on each side of the pipe at least to the spring line. Backfilling to a depth of about one foot above the top of the pipe was done by hand; the remainder by machine.

Plastic pipe gives all the advantages of asbestos cement pipe, plus the chemical resistance of vitrified clay, the Evans company states. The greatest installation advantage is that it can be cut anywhere and rejoined without further machining or working. It cuts easily, with a handsaw; can be drilled to make connections, and any inspection holes can be cut in the main and closed merely by cementing a piece of pipe over the hole.



Laying plastic sewer. Inset shows house service connection.

Four Days of Technical Sessions Highlight Western Exhibit and Conference

Four days of highly specialized technical sessions will highlight the Western Air Conditioning, Heating, Ventilating and Refrigeration Exhibit and Conference scheduled for April 27 through 30 at Shrine Exposition Hall, Los Angeles, Calif.

Under the direction of Arthur J. Hess, of Hess, Greiner & Polland, who is vice-president of the sponsoring Association, the technical program is as follows:

April 27, 2:30-4 p.m.: Panel on *cooling methods* with William Yerkes, consulting engineer with Hillburg & Turpin as chairman, and Robert H. Phillips, Carrier Corporation; Irwin C. McBride, Southern California Gas Co.; C. S. Perkins of Albert C. Martin and Associates and Ernest Alberts of Los Angeles Department of Water and Power, panel members.

A symposium on *fan auxiliaries* will be presented 6:30-800 p.m. on this same date with Ralph Phillips, Jr., consulting engineer with Ralph E. Phillips & Associates as chairman and Emmet Moylan, M. W. Sussé & Co. presenting a paper on *anti-vibration;* a member of Sterling Electric Motors evaluating *motors*, and Glenn Fildes of Fabling Company speaking on the subject, *drive selection.*

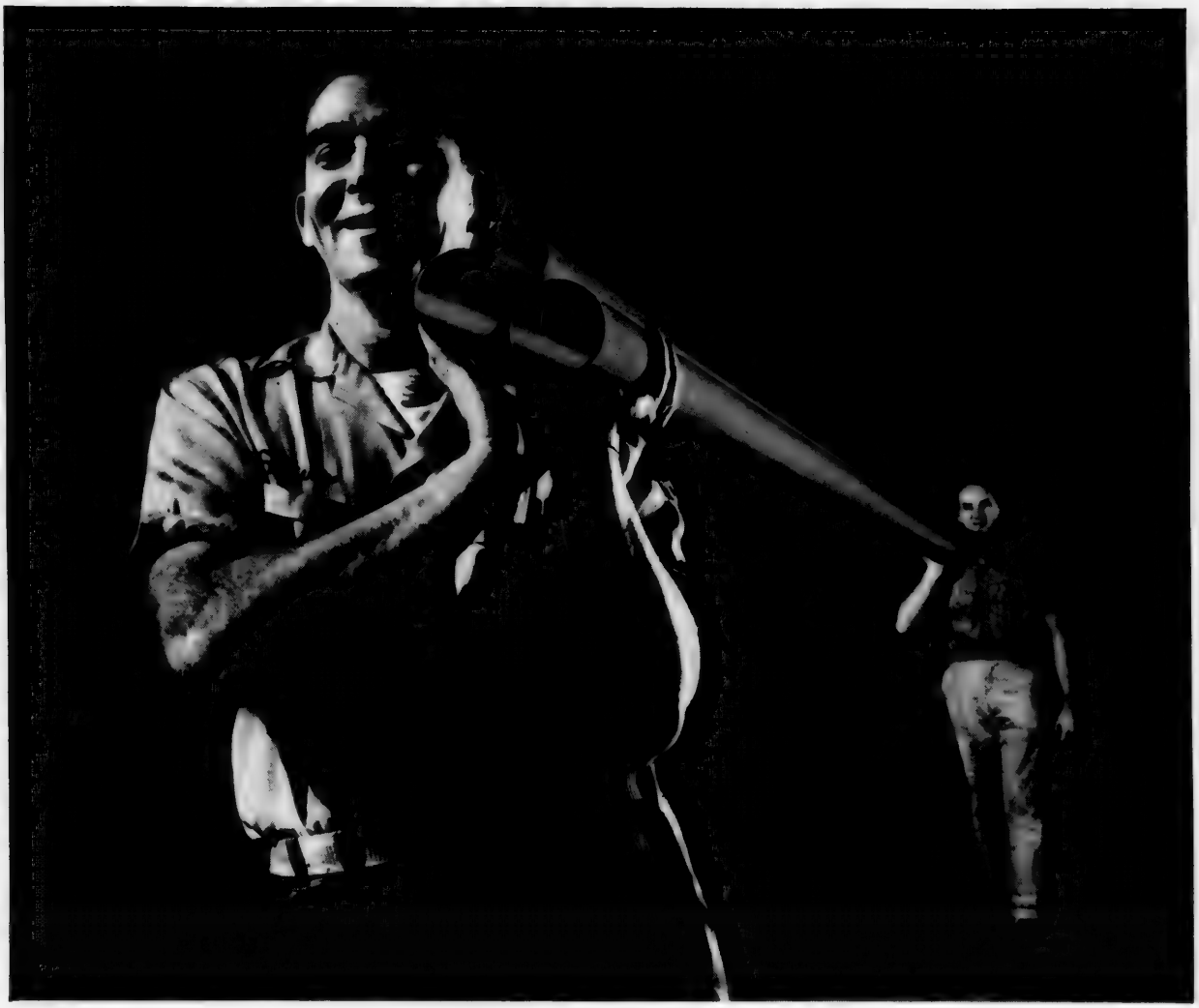
Condensing Methods

April 28, 10:30 - 12:00 noon: Chairman D. D. Wilde, engineer with Recold, Inc., will moderate a panel discussion on *condensing methods.* John Engalitcheff, president of Baltimore Air Coil Co., Inc.; Harold Halls, Recold, Inc.; and W. L. Holliday, Holliday & Westcott will participate.

Between 2:30 and 4:00 p.m. on April 28: a symposium on *testing and balancing* will be presented. Chairman will be Western Air Conditioning Industries Association President William P. Tennity. Robert Lambert, Air Factors, Inc., will speak on *air systems*; T. F. Scully, Heat & Power Equipment Co., on *boilers* and E. C. Williams, of Airservco Mfg. Co., on *refrigeration systems.*

From 6:30 to 8:00 p.m.: Ray Hess of F. B. Gardner Co. will lead

(Continued on page 126)



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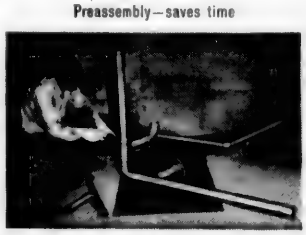

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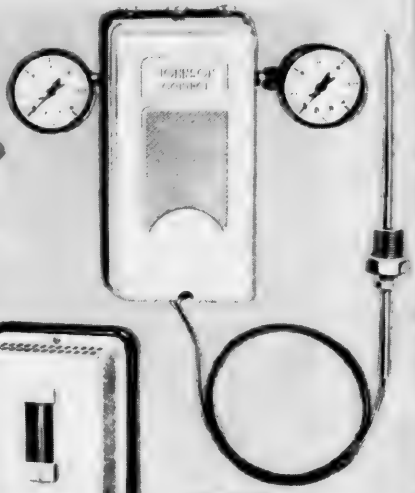
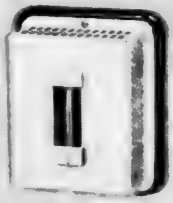
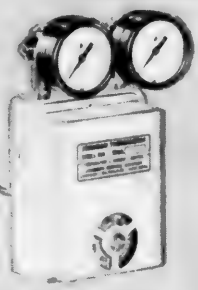
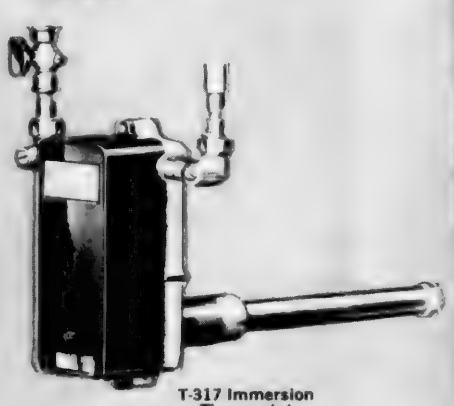
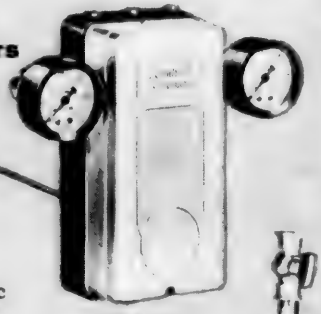

T-900 Liquid-Filled-Remote-Bulb Thermostat

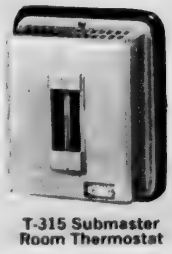

T-411 Submaster Comfostat

T-408 Room Comfostat


T-802 Liquid-Filled Insertion Thermostat

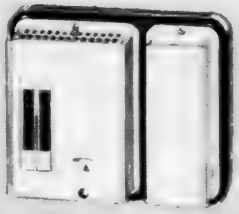

T-317 Immersion Thermostat

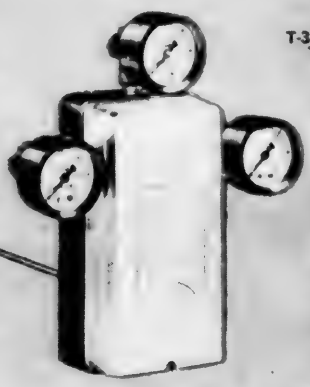

T-902 Liquid-Filled Insertion Thermostat

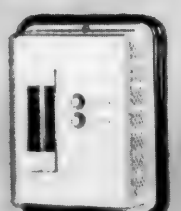

T-315 Submaster Room Thermostat

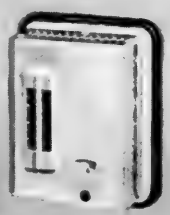
T-319 Immersion Thermostat

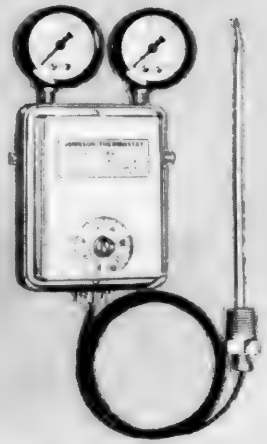
T-335 Submaster Airstream Thermostat

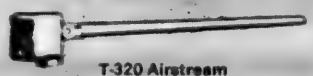

T-435 Submaster Heating-Cooling Thermostat


T-903 Liquid-Filled Submaster Insertion Thermostat


T-405 High-Low Room Thermostat


T-418 Dual Room Comfostat


T-800 Liquid-Filled Remote-Bulb Thermostat


T-320 Airstream Thermostat

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Scientific Frontiers

Waste Disposal in the Space Age

Waste conversion techniques for the space age, reported in *Business Week* and deemed worthy of noting here, have been developed into a balanced total environment system that can handle the problem of disposing of noxious organic materials from sealed space ships by turning them into reuseable products.

Martin Company's Denver Division researchers already have started the engineering for a "lunar housing simulator", which will be a self-contained little universe all its own.

Since a space vehicle will be completely sealed, a total environment, simulating conditions on earth, will have to be created. Plants and animals will be taken along to carry out the same functions as they do on the earth. The plants will provide oxygen necessary for animal and human life, and the animals will eat the plants and release the carbon dioxide needed to produce more plants.

The plants also figure in the sewage gardens—an unusual waste conversion system that was devised especially for use in a space ship—but which also may someday help communities and industry handle their sewage and waste problems more effectively. Since the space ship will be completely sealed, it may not be feasible to discharge waste materials. And they can't be allowed to accumulate in any great quantity, either. So, the only solution was to find a way to convert them into useful, reusable products. In the system envisioned for a lunar ship, the noxious materials will be dumped into tanks of water containing algae and bacteria. Through photosynthesis, the waste solids become algae —which animals can eat—and the waste liquids are changed back into drinkable water.

The process, known as photosynthetic oxygenation, developed out of research begun nine years ago at the University of California. The scientists' initial interest was the improvement of commercial sewage treatment techniques. But, with the dawning of the space age, their interest shifted to working out a complete and balanced system that would eliminate the need for discharging waste altogether.

Bulk of the research was handled by Dr. William J. Oswald, a sanitary engineer from the University of California, and Dr. Harold B. Gotaas, now dean of the Technological Institute at Northwestern. Later, Dr. Clarence G. Golueke, a research biologist at California, joined the team.

Essentially what Drs. Oswald and Golueke did was to apply their biologic science to the long-used ponding system of sewage treatment by introducing algae and bacteria. In ordinary ponding, after some solids have been screened out, the wastes are dumped into a pond of water, and the algae normally present in any water consume and grow on the remaining solids and give up oxygen in the process. But this natural process is a slow one and requires a large pond. But by putting more algae into the water and also bacteria, the whole purification process is speeded up and can use a smaller pond. For the needs of the few people on a space ship, a tank would suffice.

The photosynthetic oxygenation process works like this: The algae supply the bacteria with abundant oxygen, while the bacteria supply the carbon dioxide for the conversion of the solids in the sewage into more algae. Sunlight also is necessary for the algae to grow.

After the process had been tested under laboratory-controlled conditions — in which algae and bacteria were grown continuously in human wastes in king-size test tubes—a moderate-scale test was conducted at the sewage treatment plant in the small city of Concord, Calif. And, on the basis of these results, Drs. Oswald and Golueke believe that the process is workable for any city that must treat its sewage and has a large amount of not too expensive land available nearby. They estimate that an American City, on the average, produces about 100 gal. of sewage per person per day. At the present stage of development, their process can handle about 100,000 gal. per day on each acre of pond. Each acre then would take care of 1,000 people. This is theoretical, based on the moderate-sized pond operated at Concord. The scientists hope to reduce the land requirement by as much as one-half as they refine the process.

From time to time, some of the algae has to be removed from the pond, and Drs. Oswald and Golueke accomplished this by centrifugation. After it has been dried out, the algae can be ground into meal. The university researchers found that algae is 40% to 50% protein and contains large amounts of Vitamin A. This makes it useful as a feed supplement. Experiments showed that chicks could get one-fifth of their nutritional requirements from the algae meal without harmful effect. Experiments using the algae as feed for other animals still lie ahead. Since the algae is rich in calcium, nitrogen, magnesium, phosphate, and potassium, it also can be used as fertilizer.

While the decontaminated sewage water would not be harmful for human consumption, most persons, understandably, would rather go thirsty. But the purified water might be used for irrigation, though its mineral deficiency makes this application dubious for extended use. It would be ideal, however, for industrial cooling, and could also be used for other industrial purposes where the water has to go through a purification process anyway.

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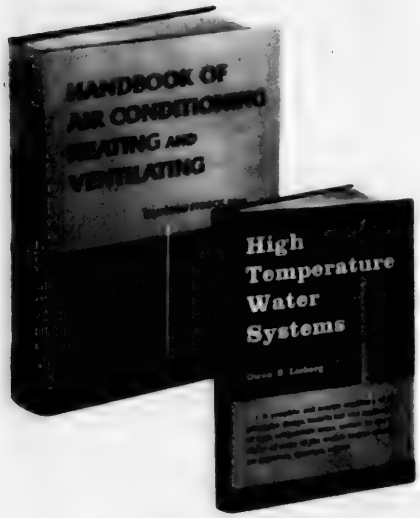

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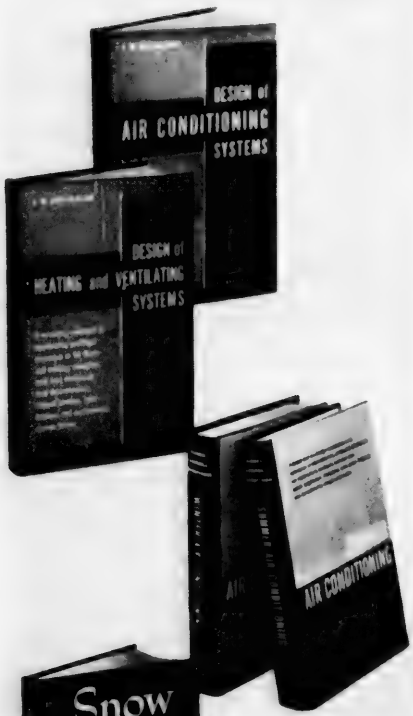

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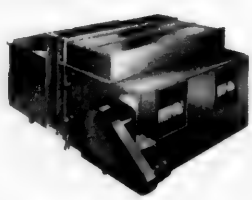

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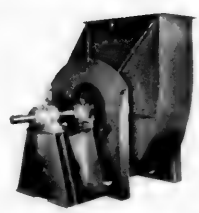
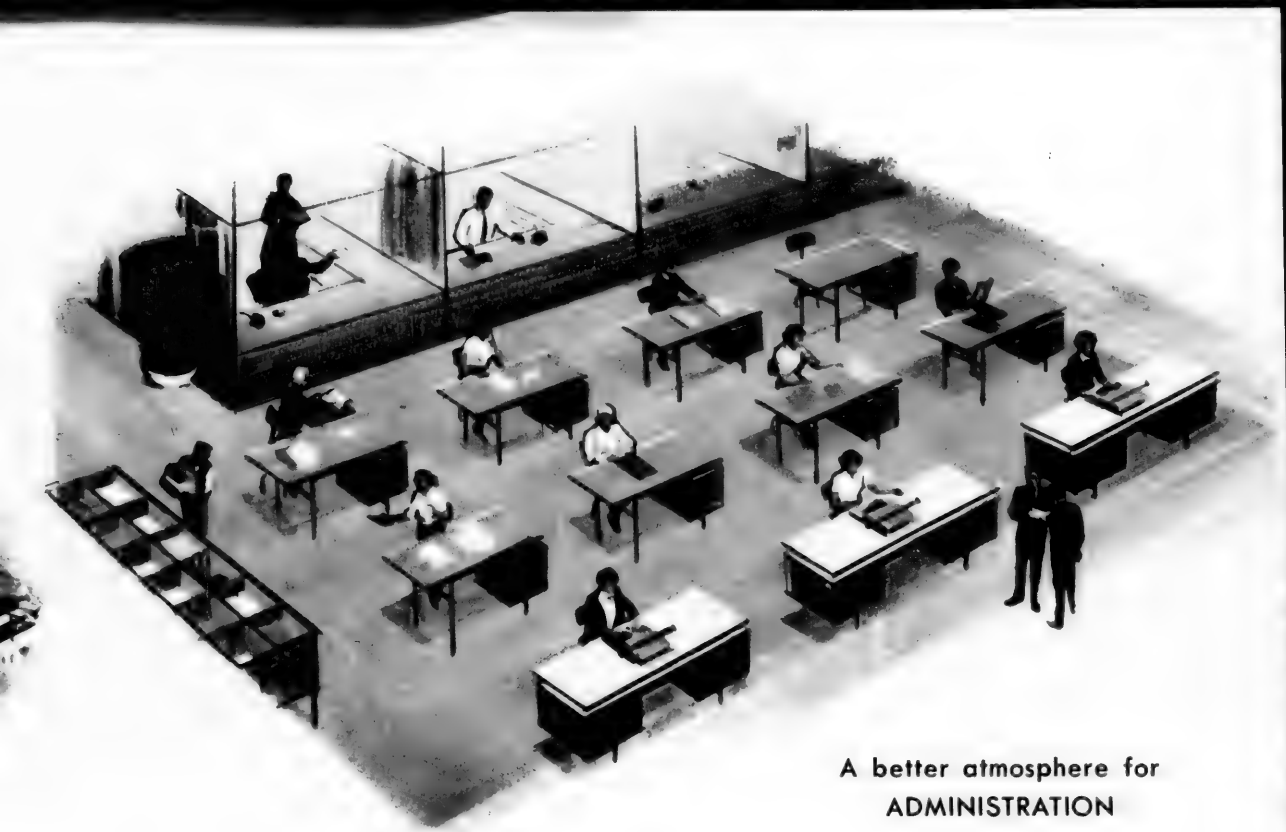


Centrifugal fans for supply or exhaust in duct systems.

Industrial fans for h
air, gases, and m

COPYRIGHT 1959, AMERICAN RADIATOR & STANDARD SANITARY CORPORATION



A better atmosphere for
ADMINISTRATION

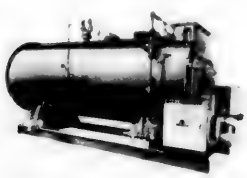
ienced team to make indoor climate behave

Here's how we fit in . . .

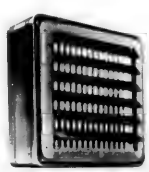
American-Standard Industrial Division product specialists work right along with your plant operating managers, your architect, consulting engineer, and contractor. They have the equipment to do the most efficient job in every phase of inplant environment control . . . from air-conditioning, heating, makeup air and exhaust to dust collection and process air handling. And they have the experience and know-how to help you from the planning stage to final installation. Coordinated products and services give you a better atmosphere for administration, improve efficiency in manufacturing . . . give your entire plant an AIR-LIFT.

handling
aterials.

HEATING



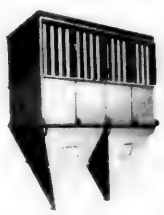
Boilers and package units for heat and process steam.



Vertical and horizontal unit heaters for steam, hot water.

AIR POLLUTION CONTROL

Dust collectors tailored to the type and amount of dust.



Fly ash collectors to control emission and recover fly ash.

One-source responsibility

The heart of American-Standard Industrial Division's Air-Lift Service

Better control of inplant environment requires many different kinds of equipment . . . equipment which must work together as a system.

By selecting *all* the major components from American-Standard* Industrial Division, you draw from the combined American Blower, Ross, and Kewanee product lines. You get equipment designed, engineered, and manufactured to work together. You get *one-source* responsibility for quality and performance—an important benefit of American-Standard Industrial Division's Air-Lift Service. Air-Lift helps you lift the productivity and profitability of your business.

Offices in all principal cities are staffed by product specialists to help you with equipment selection and on-the-job problems. Give the office near you a call. AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICHIGAN. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO. EXPORT DIVISION, AMERICAN-STANDARD, NEW YORK CITY.

Products designed, engineered, and manufactured to work together

AIR CONDITIONING

Centrifugal refrigerating machines • Central station units • Fancoil units • Self-contained air conditioners • Package water chillers Multi-zone air conditioners Sprayed coil dehumidifiers • Heating and cooling coils • Air washers

AIR HANDLING

Industrial fans with wheel types for handling air, gases, materials, and shavings • Centrifugal, propeller, tubeaxial, and vaneaxial fans • Utility sets • Power roof ventilators • Centrifugal compressors • Specialized fans, blowers

HEATING

Firebox, scotch-type steel boilers and package units for heat, process steam • Vertical and horizontal unit heaters for steam or hot water Heavy-duty heating coils • Industrial unit heaters • Heating and ventilating units • Cabinet heaters

AIR POLLUTION CONTROL

Dust collectors and fly ash collectors for eliminating dust and recovering fly ash • Cyclone-type centrifugal dust collectors • Disposal systems • Tubular-type centrifugal collectors • Package units • Electrostatic precipitators

POWER TRANSMISSION

***Gyrol*® Fluid Drives for stepless, adjustable-speed control of driven machinery • Complete range of sizes, 1 hp thru 12,000 hp • All provide extremely smooth pickup of the load, affording maximum protection for motor and machine**

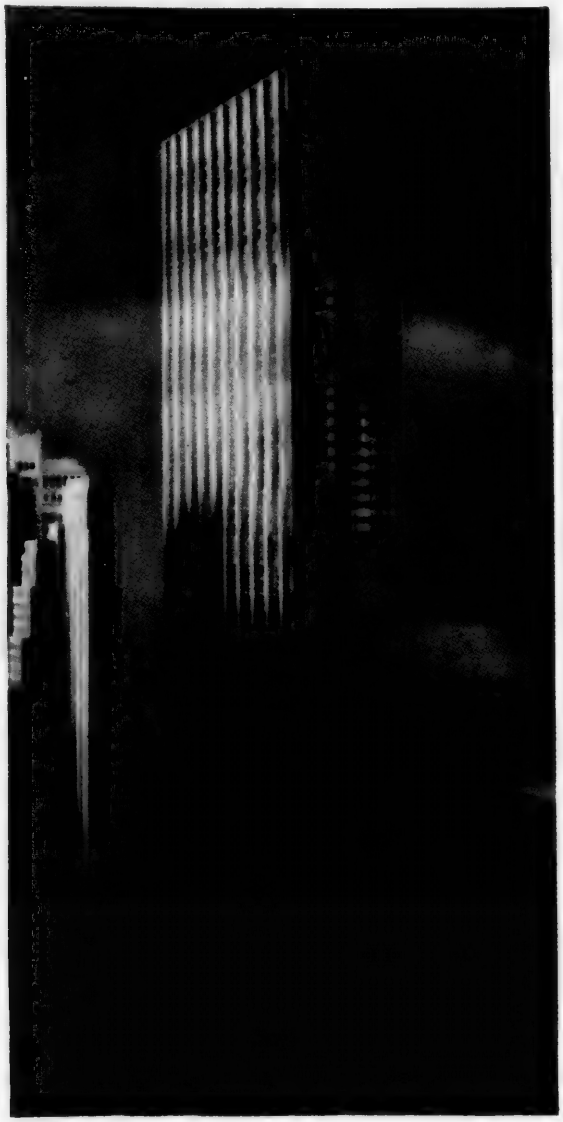
HEAT TRANSFER

Standard and engineered heat exchangers, condensers, and feedwater heaters for every requirement Oil and gas coolers • Refrigeration condensers and coolers • Instantaneous water heaters for service-water, booster, convertor duty

*American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS



20,000,000 cubic feet in New York's new 60-story Chase Manhattan Bank will be air-conditioned and heated with the help of some 1,500 tons of Bethlehem Steel Pipe

Beth-Co-Weld to 4-in., nom., and
Electric Resistance-Weld to 16-in. OD.

Architect: Skidmore, Owings & Merrill.
General Contractor: Turner Construction Co.
Mechanical Contractors: Raisler Corp. and Kerby Saunders, Inc.—A joint venture.
Pipe Jobber: Chas. F. Guyon, Inc.
Mechanical Engineers: Jaros, Baum & Bolles.

For general purpose piping,
always choose *steel* pipe:

first in strength
first in service
first in economy

Insist on steel pipe *Made in U. S. A.*

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

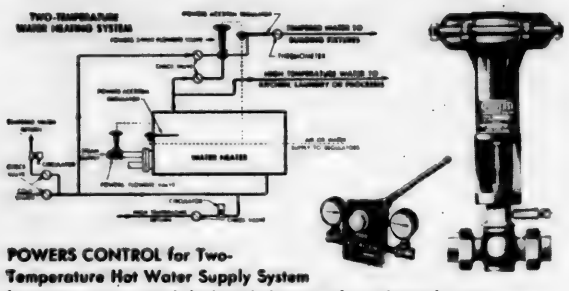
BETHLEHEM STEEL

In Colorado's largest private general hospital

ST. MARY-CORWIN HOSPITAL
PUEBLO, COLORADO
Architects: MORROW, IRWIN & DUNHAM, Denver, Colo.
Mechanical Engineers: MARSHALL & JOHNSON
Mechanical Contractor: MATHIS & COMPANY
General Contractor: ROBERT E. McKEE

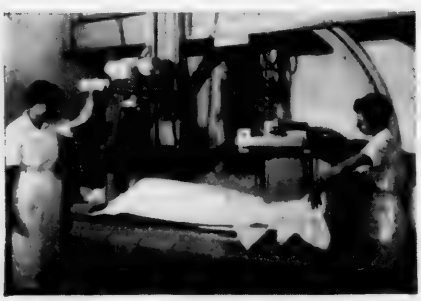
For more than 75 years the Sisters of Charity have been caring for the sick in Pueblo's St. Mary Hospital. Now its new imposing structure the St.. Mary-Corwin Hospital contains modern facilities unsurpassed for diagnosis and treatment of disease, patient care and comfort. Powers Temperature Control here helps increase hospital efficiency.

Above: Recovery room for efficient post operative care



POWERS CONTROL for Two-Temperature Hot Water Supply System here prevents wasted fuel and danger of overheated water.

(D8)



THERMAL COMFORT throughout is provided by POWERS Temperature Control for each individual room and various types of baths

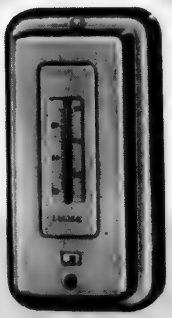
Proper Thermal Environment is important in this 450 bed hospital. Patients, nurses, doctors and staff benefit from Powers air conditioning control in the surgical suite consisting of 8 major and 3 minor operating rooms, recovery and delivery rooms, X-Ray department, laboratory, maternity department and pediatric unit. Temperature in other spaces is also regulated by Powers individual room control system.

Greater Simplicity and year after year dependability of a Powers Pneumatic Control-System provides these money saving benefits —

Lower Heating Costs — Powers accurate control prevents discomfort of over-heating and reduces fuel losses.

Lower Maintenance Cost — 25 to 40 years of dependable control with a minimum of repairs is often reported by users of pneumatic control systems. Some are still in operation after 50 years of service.

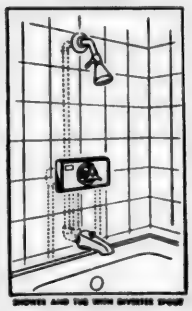
Powers Complete Responsibility — for a correctly engineered control system, proper installation, continuous successful operation and prompt SERVICE, when required, from offices in 85 cities.



732 Powers Pneumatic Thermostats maintain set temperatures constantly. They need no daily checking or readjusting. Patients, nurses, doctors, staff and visitors all benefit from the THERMAL COMFORT they provide throughout the hospital.

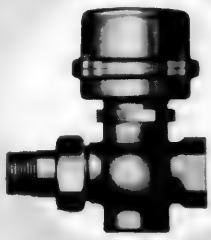
For Sitz Baths, Shampoo Tables, Arm and Leg Baths, etc.

PATIENT'S SAFETY and COMFORT in Hydrotherapy, showers, and infant baths are assured by Powers HYDROGUARD thermostatic water mixers. They are also used for X-Ray film developing, surgeon's wash-up sinks, artificial kidneys, blood coolers in heart surgery and many other applications.



Powers makes the most complete line of water temperature control

NO MORE Valve Packing Maintenance or Water Leakage with Powers PACKLESS Valves.



864 Powers PACKLESS Control Valves are used here on convectors, and unit ventilators. They're labor savers, and cut the cost of maintenance.

Are You Planning a New Hospital? No other single firm makes so many of the essential thermal comfort controls for modern hospitals as POWERS. Only a few are shown above. Ask your architect or engineer to include a Powers Quality System of Thermal Comfort Control—throughout the building for heating, air conditioning, various baths and hot water heaters.

THE POWERS REGULATOR COMPANY

SKOKIE, ILL. | *Offices in 85 Cities in U.S.A. and Canada*

MANUFACTURERS OF THERMOSTATIC CONTROLS SINCE 1891

Hospitals Choose Bryan

FOR DEPENDABILITY AND SPACE ECONOMY

BRYAN
Copper Tube
BOILERS

More and more hospitals are installing Bryan equipment for both space heating and water requirements. The exacting demands of these institutions make dependability and efficiency imperative. Bryan Boilers and Water Heaters also meet the need for economy in boiler room space. Write for engineers specifications, available on Bryan Boilers to fit every type installation.

The New Modern Addition to the Normandy Osteopathic Hospital in St. Louis, Missouri, is Bryan equipped. Two Bryan Hot Water Boilers provide for Space Heating. Two Bryan Indirect Commercial Water Heaters supply the Domestic Water Requirements. A Bryan High Pressure Steam Boiler supplies 100 psi steam for Sterilizing, Kitchen and Laundry Equipment.

Architects: Drake & O'Meara
212 Bemiston Ave., St. Louis, Mo.

Engineer: Crawford & Witte
6552 Clayton Road, St. Louis, Mo.

Heating Contractor: John C. Murphy Co.
4376 Olive St., St. Louis, Mo.

Plumbing Contractor: E. J. Fischer
4134 Westminster Ave., St. Louis, Mo.

Bryan Sales Rep. C. H. Schuettenberg Co.
4604 Pope Avenue, St. Louis, Mo.

Bryan Copper Tube boilers are designed and built to the requirements of the A.S.M.E. Code. Gas-fired models A.G.A. approved.

BRYAN STEAM CORPORATION • Peru, Indiana

dual-duct

by Buensod is an extremely efficient system of air conditioning the year 'round. In the Dual-Duct method, warm air flows through one duct, and cool air through the other. They are combined by the patented Buensod Air Mixing Unit in response to a thermostatic setting. And with self-contained Automatic Volume Control, pioneered and perfected by Buensod, it is impossible for zones to be thrown out of balance. Regardless of variance in static pressures, air volume is maintained ±5%. Ask your Buensod representative, or write us, for the complete story.

BUENSOD DUAL-DUCT

Buensod-Stacey, Inc., 45 West 18th St.
New York 11, N.Y.

BUENSOD STACEY

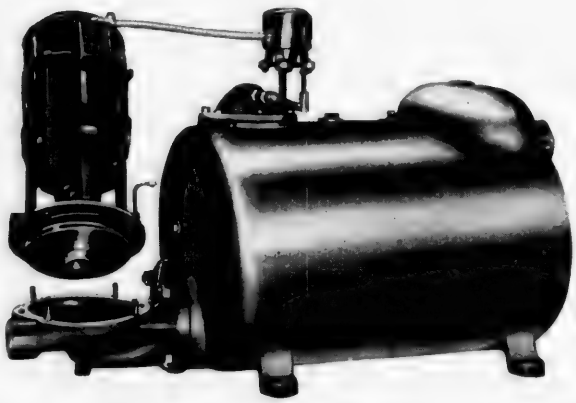
Specify SKIDMORE

FOR PUMP PERFORMANCE NOT PUMP PROMISES

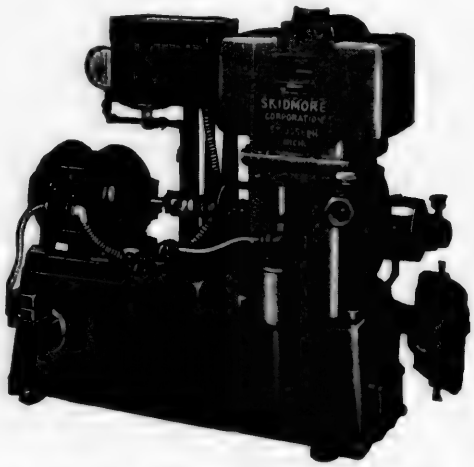
TWO OUTSTANDING SKIDMORE PUMPS THAT HAVE STOOD THE PERFORMANCE TEST!

1 Easily Accessible • • • • • • Compactly Designed

2 Maintained Efficiency Year After Year



TYPE VC, SINGLE UNIT — low inlet connection . . . quiet operation.



VACUUM PUMP, SINGLE UNIT — automatically adjusts itself to the varying conditions.

There's a Skidmore Pump designed for each and every heating requirement.

Write for Bulletins

SKIDMORE PUMPS

SPECIFY WITH CONFIDENCE

SKIDMORE CORPORATION ST. JOSEPH, MICHIGAN

try this on your pipe...

(it's Pittsburgh Fiber Glass Pipe Insulation)

Acme Insulation Company, Pittsburgh, did . . . on the piping job at Pittsburgh's new Gateway Parking Garage in Gateway Center. And here's what Acme owner Walter S. Peebles says about this installation:

"We chose Pittsburgh Fiber Glass Insulation for its efficiency, appearance and permanence. It's lightweight, handles easily, cuts readily with a knife, is quickly applied. There's a minimum of waste material.

"We've found that Pittsburgh Pipe Insulation holds its size and shape, does not effect the metal it covers, and has a fine record for low-cost maintenance. We used 8,300 ft of it on ½" to 14" pipe for underground heating, snow melting, chilled water lines, general plumbing, sill cocks and drain lines.

"It's probably the finest insulation that can be used, especially in subsurface locations."

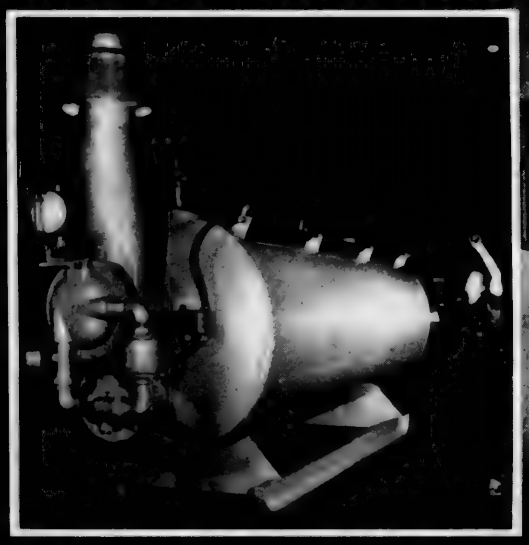
FOR TOP THERMAL CONTROL, THIS IS IT! Pittsburgh Fiber Glass Pipe Insulation is a molded flexible hollow cylinder, slit along its length to provide quick application to pipes or tubing. It has high thermal efficiency for any type pipe insulating job and is surprisingly economical. You can get complete details from your nearest PPG Fiber Glass Sales Office, or by writing to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

SALES OFFICES: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Fort Wayne, Houston, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco and Washington.

FIBER PPG GLASS PITTSBURGH PLATE GLASS COMPANY

FIRST

INDIRECT GAS FIRED STORAGE WATER HEATER FOR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL USE



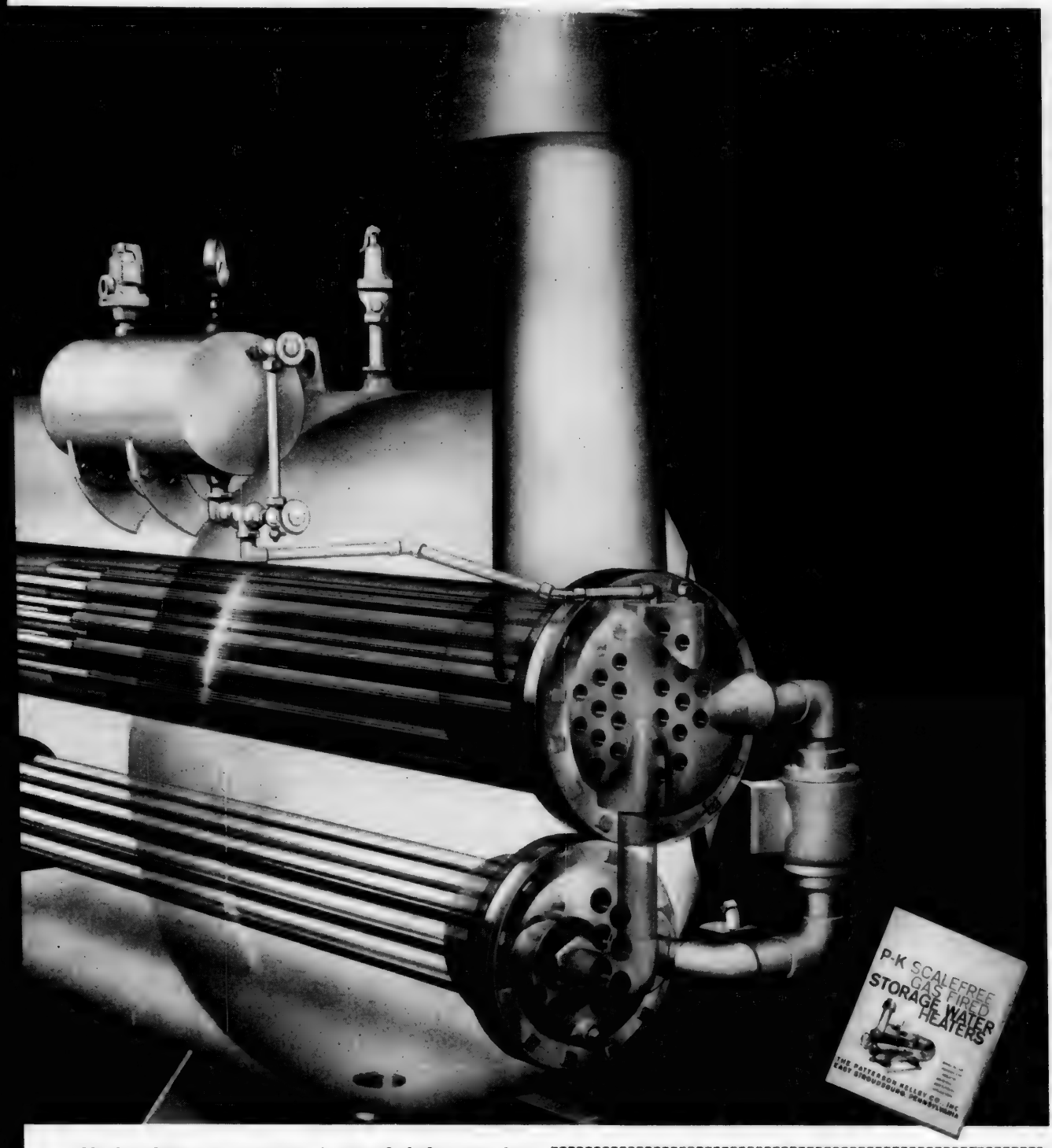
- *No scaling*
  - *No drop-off in rated efficiency*
- *No fuel waste*
  - *No on-the-job assembly*
- *No complicated maintenance*
  - *No limitations on placement*
- *Fully automatic*
  - *Copper heating sections*
- *Available in more than 100 storage and recovery combinations*

The first indirect gas fired design in storage water heaters is a rugged industrial type unit with finest controls and safeguards. It is backed by P-K's 80 years of experience in building and designing quality water heating equipment. Its name: SCALEFREE 230*.

P-K SCALEFREE 230 heats surface water through hot intermediate distilled water. Transfer occurs below the temperature at which minerals that cause scaling precipitate. Efficiency remains unimpaired throughout service life. Linings of Pre-Krete or copper are available to keep the unit free of rust and corrosion regardless of water conditions.

SCALEFREE 230 features a new P-K gas burner. It operates at maximum practical efficiency. Yet it gives almost noiseless service—does not rumble or boom on startup. This permits location almost anywhere in office buildings, institutions, schools, motels, etc.

SCALEFREE 230 is a complete fully automatic package that can be quickly set in place, hooked up, and checked out. It requires only simple electrical, water and gas connections. No stack is needed for extra draft—only a vent.



No foundation is necessary. A rugged skid-in type base is supplied. It is easily accessible for inspection. Tube bundles are removable.

SCALEFREE 230 is completely safe. It has a fail-safe chain of built-in protective devices. It is available in more than 100 storage and recovery combinations. Storage capacities range from 250 to 4000 gallons. Recovery sections range from 390,000 to 2,215,000 Btu. Send the coupon for complete information.

*Patent pending

Patterson Kelley

101 Morgan Ave., East Stroudsburg, Pa.

☐ Please send complete technical data on SCALEFREE 230

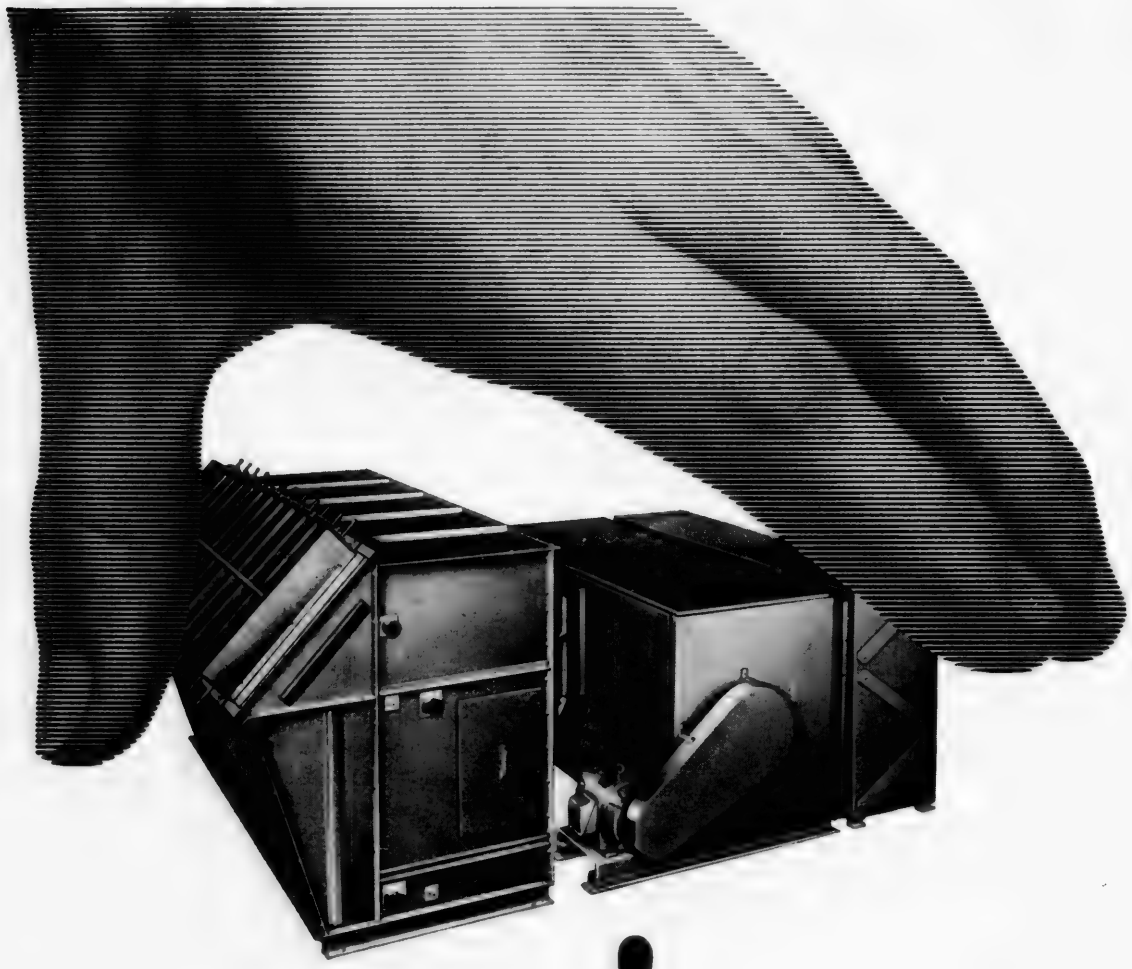
☐ Please have a P-K Sales Engineer call to discuss design and operational features.

Name_____ Position_____

Company_____

Address_____

City_____ Zone_____ State_____



news! high pressure conditioned air distribution is packaged ...just pick the combination for your job.

The sectional design of Westinghouse Air Distributing Units permits in-line installation for dual duct and other high velocity air conditioning systems. Installation costs are lower because of factory fabricated compact design.

Take a look at the features in the new high pressure fan sections:

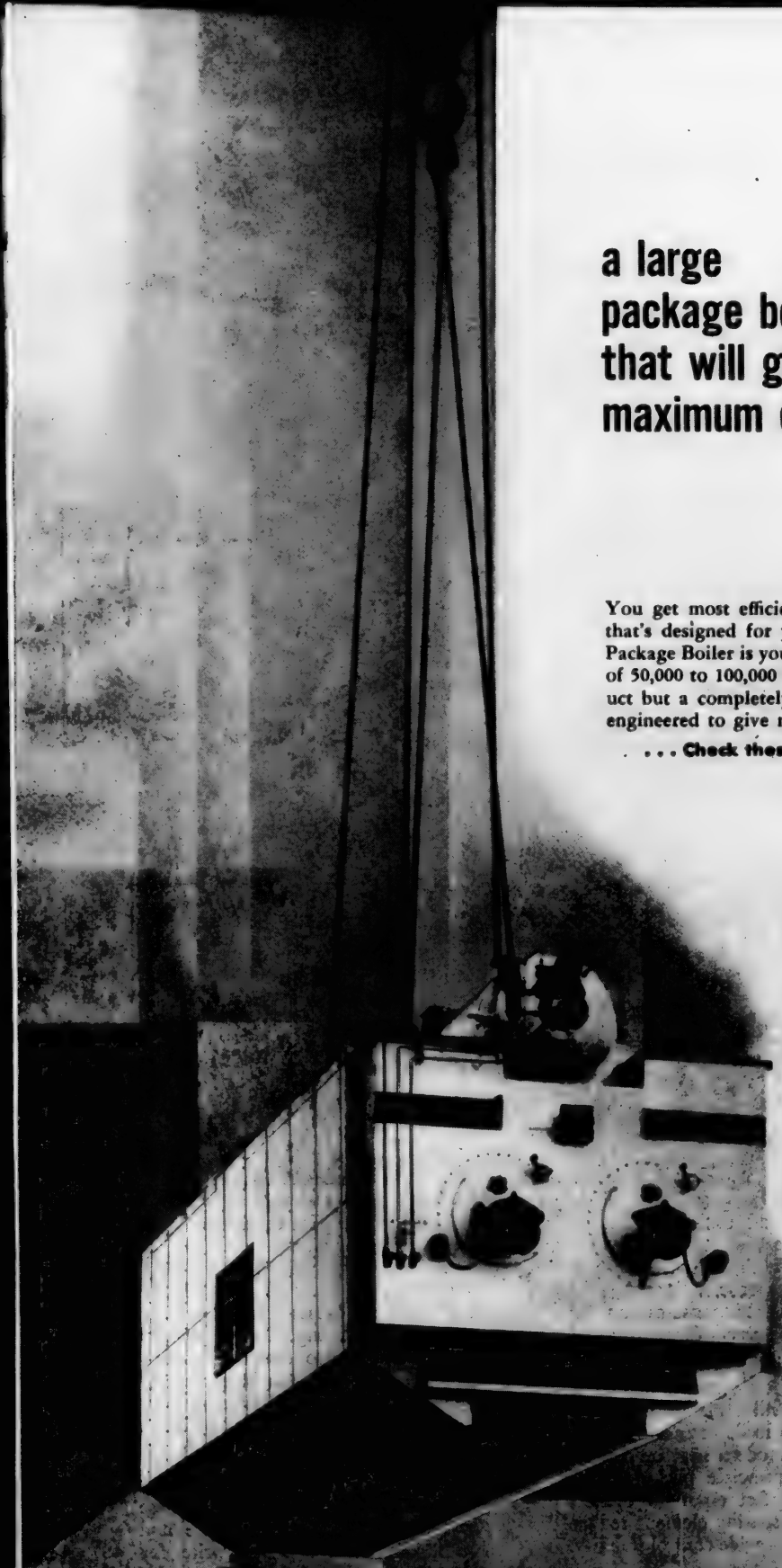
- Range of pressures up to 9 inches.
- Tested fan performance insures steady air flow, eliminates noise and pulsation.
- New developments reduce horsepower; motors can be smaller, less costly.

Match these features with the top qualities found in the other components of these units . . . heating and cooling coil with the unique air activating fins and more prime surface than any other coil . . . coil face velocities up to 700 fpm that permits smaller units without moisture carryover . . . plus optional in-line Electronic air-cleaning with the PRECIPITRON®!

Find out more . . . call your Sturtevant Engineer or write Westinghouse Electric Corporation, Dept. CV98, Hyde Park, Boston 36, Mass.

YOU CAN BE SURE...IF IT'S Westinghouse

J-80698



a large package boiler that will give you maximum efficiency and economy

You get most efficient steam generation when you select a boiler that's designed for your specific duty range. The B&W Type FO Package Boiler is your best buy if your requirements are in the range of 50,000 to 100,000 lb/hr. Not an enlargement of an existing product but a completely new oil and gas-fired boiler, the Type FO is engineered to give maximum efficiency, economy and quality.

. . . Check these B&W Type FO Package Boiler Benefits

Optimum Output because heating surface and furnace volume are properly balanced. And because B&W builds both the boiler and burner, they go together as a completely integrated steam generating package.

Minimum Maintenance is "designed in." For example, you get *natural* circulation, completely water-cooled furnace, skin casing, drainable superheater design.

Greater Efficiency Over Entire Operation Life optimum heat absorption — top burner performance — forced draft operation — constant steam temperatures over a wide load range.

Start Up Assistance B&W's extensive service organization assists you in starting up your boiler and gives instruction in its proper operation.

Whatever *your* particular steam requirements, check with B&W engineers when making your decision. You'll find a range of package boilers with industry-leading features. Call your local B&W representative or write direct to The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

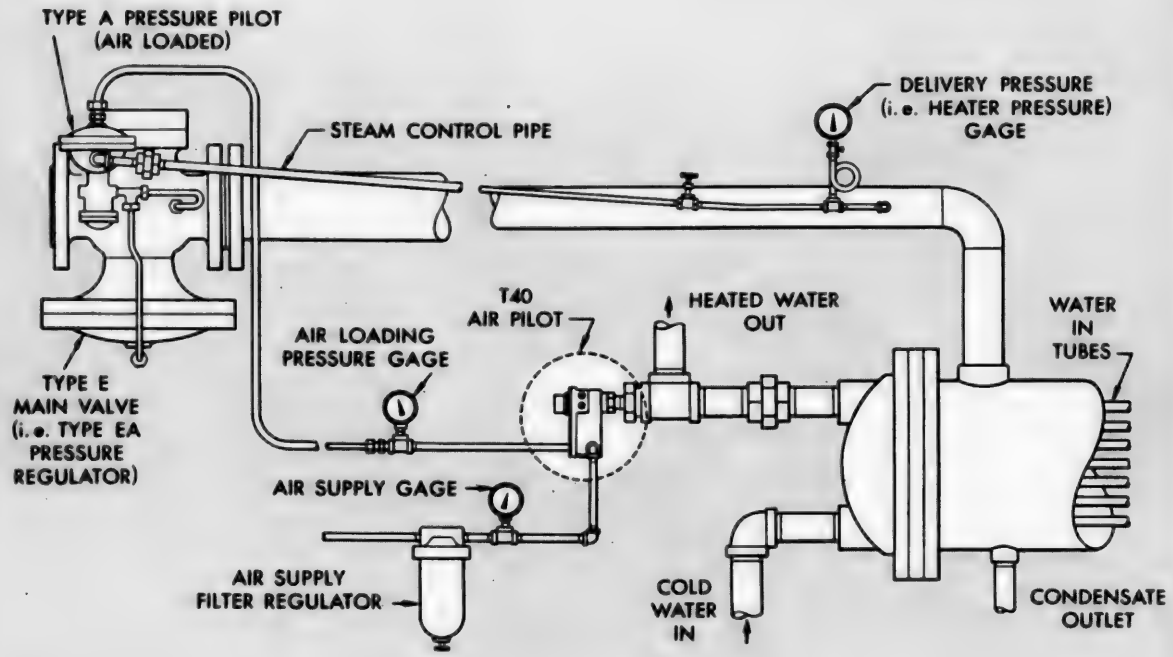
G-912

B&W

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

New Spence Temperature Control System Gives Unusual Control Accuracy


TYPE A PRESSURE PILOT (AIR LOADED)
STEAM CONTROL PIPE
DELIVERY PRESSURE (i. e. HEATER PRESSURE) GAGE
T40 AIR PILOT
HEATED WATER OUT
WATER IN TUBES
AIR LOADING PRESSURE GAGE
TYPE E MAIN VALVE (i. e. TYPE EA PRESSURE REGULATOR)
AIR SUPPLY GAGE
AIR SUPPLY FILTER REGULATOR
COLD WATER IN
CONDENSATE OUTLET

TYPE EAT40 AIR-CONTROL TEMPERATURE REGULATOR

In a recent installation the new Spence air-control temperature regulating system provided:

- ±5°F control accuracy under wide and instantaneous load swings of 210 to 80 gallons per minute.
- Up to 50% reduction in cost as compared to instrument systems of similar accuracy.

This unique cascade-type control with throttling range adjustment independent of maximum heater pressure was developed to meet today's demand for greater control accuracy.

Additional features of the new Spence Temperature Control System include:

- 200°F wide adjustable temperature range
- Adjustable speed of steam pressure change
- Over and under temperature protection
- Pressure limit control
- Fast response
- Very low air consumption
- Field reversible for heating or cooling

The Spence Type EAT Air Control Temperature System, when properly installed, will tame wide ranging, fast changing loads of instantaneous heaters and modern heat exchangers. The cascade principle plus the use of an extremely fast responding bi-metal temperature sensing element reduce time lags and provide control stability.

Here's how the new Spence system operates:

Quick response is based on a bi-metal temperature sensing element.

Temperature pilot continuously regulates a loading air pressure.

This loading signal, when applied to a pressure regulator to reflect heater temperatures, causes it to adjust the main valve as changes in load require.

Spence has also developed a new pressure control system based on this same cascade principle. This system has a control accuracy of ½ psi or better from positive pressures through the vacuum range to 30" Hg.

For complete information on these new air controlled temperature and pressure control systems, write for your copy of Bulletin 9.

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

So Versatile, So Dependable ...and So Easy to Work With

McQuay thin-line design SEASONMAKER

McQuay thin-line design individual room Seasonmakers are popular, not only because of their convenient size, their high efficiency and their inherent quality, but because they are so extremely versatile and dependable. Every part is easily and quickly accessible. They are easy to install and easy to work with. For example, filters are easily changeable; the slide-out fan deck is quickly removable; the hand of coil is easily reversible in the field.

All McQuay Seasonmakers utilize central station heating and cooling and are available with capacities of 220, 330, 440, 520 and 640 cfm. They furnish individual room comfort at any desired temperature level—heated, filtered air in winter and cooled, dehumidified and filtered air in summer. Seasonmakers are ideal for multi-room buildings such as hotels, apartments, motels, schools, hospitals, offices and residences.

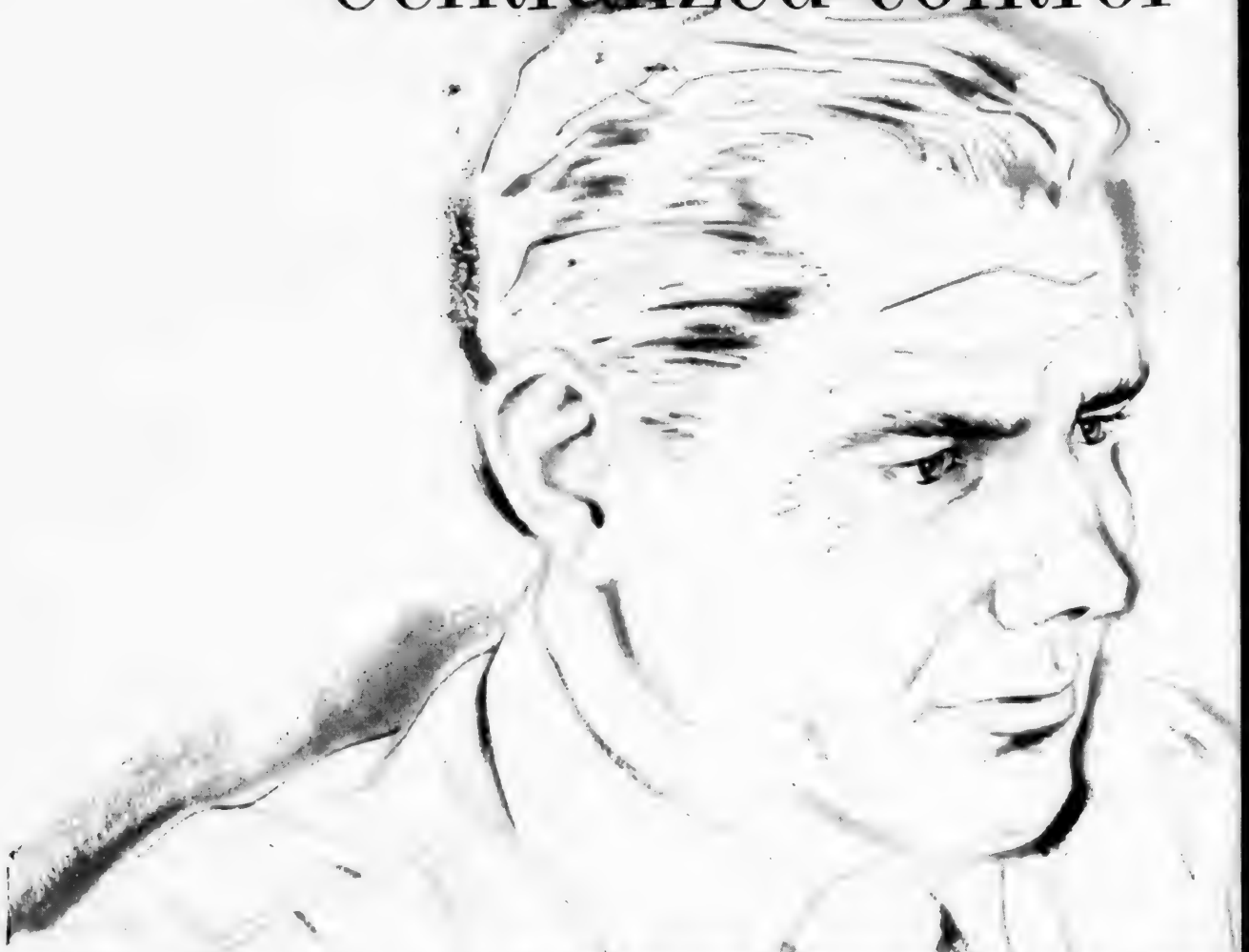
If you haven't already done so, investigate McQuay individual room Seasonmakers. For complete information call the McQuay representative in or near your city, or write McQuay, Inc., 1619 Broadway St. N. E., Minneapolis 13, Minnesota.

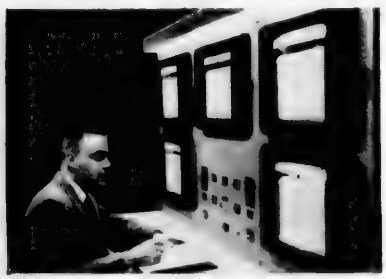
ONLY 8 1/2" THIN
25 INCHES HIGH
6 Models in 5 Sizes

McQuay INC.

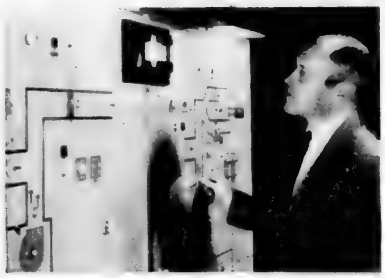
AIR CONDITIONING • HEATING • REFRIGERATION

Centralized control

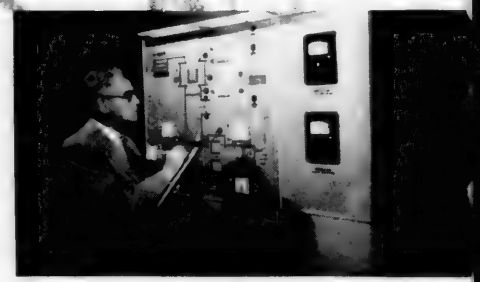




One "Electronic" recorder provides a permanent 24-hour record of temperatures at as many as 24 different points in the building.

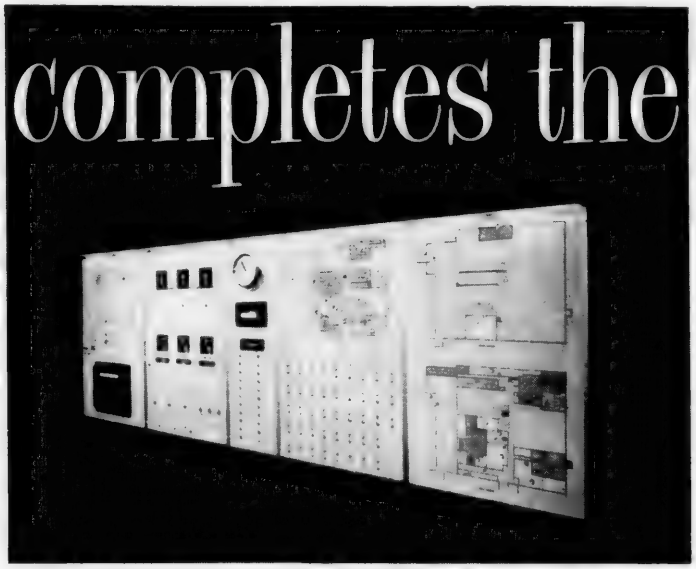


A single "Electronic" eye-level indicator can be used to check temperatures at an unlimited number of points throughout a building.



One man can monitor all mechanical services, check and change temperatures, start and stop equipment, communicate with other areas.

completes the system



Centralized remote control of air conditioning, and other mechanical services is a highly profitable investment for the building owner. It places management and operation of the services in the hands of a single responsible supervisor. It eliminates endless running from point to point to check and correct temperatures and other variables . . . frees maintenance mechanics to do the work for which they are employed . . . reduces the size of the service staff required. By providing the opportunity for constant monitoring, centralized control saves fuel and power — and because it reports faulty functioning of any unit, it permits preventive maintenance to be performed before costly damage may be done.

Barber-Colman "Electrionic" control centers are the ideal answer. They do the job better — electrically. Simple and reliable, they provide instantaneous indication and control, eye-level readings, pushbutton operation and, where desired, a permanent recording of the performance of the system.

Functions which can be performed include temperature indication, recording, and adjustment, as well as start, stop, and indication of operation of valves, motors, blowers, pumps, fans, alarms, heating and refrigerating equipment, lighting, and other equipment.

Barber-Colman "Electrionic" control centers *complete* the system, assuring at all times ideal comfort conditions for the occupants of the building.

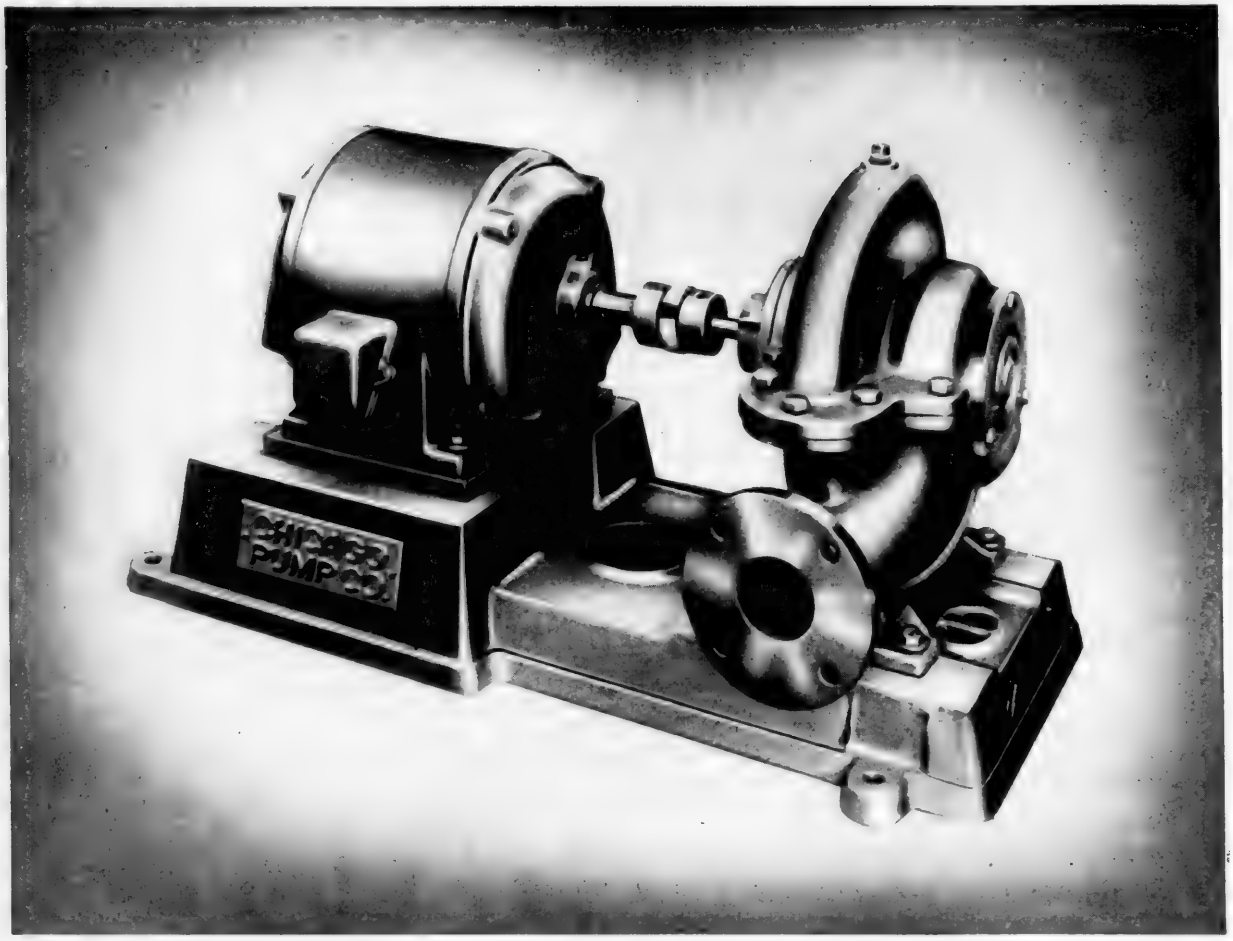
Ask for new Bulletin No. F-8944, which describes and illustrates control center values and explains the unique advantages of "Electrionic" control.

BARBER COLMAN

KEEP PACE ELECTRICALLY

BARBER-COLMAN COMPANY

Dept. C, 1302 Rock Street, Rockford, Illinois



"from Chicago"

A NEW LINE OF HORIZONTALLY SPLIT-CASE CENTRIFUGAL PUMPS

Quiet Operating . . . Low Cost . . . Efficient, Hydraulically Balanced

FOR

AIR CONDITIONING
Air Washing
Chilled Water Circulating
Condenser Water Service
Cooling Tower Circulating

BOOSTER
Increasing City Water Pressure

HEATING
Boiler Feed
Condensation
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PNEUMATIC WATER SYSTEMS
Automatically maintaining the required pressure in closed tanks to instantaneously deliver water to all fixtures.

REFRIGERATION
Water Circulating

SNOW MELTING
Ethelene Glycol Circulating

Chicago Pump Company announces a new line of Single Stage, Horizontally Split-Case Centrifugal Pumps—known as Type "S".

These pumps feature heavy shafts . . . short span between bearings . . . minimum space requirements . . . excellent operating efficiencies . . . desirable capacity-head characteristics . . . pre-lubricated ball bearings . . . mechanical seals . . . easily removable rotating assembly . . . suction and discharge on same lower casing centerline . . . rugged construction throughout to insure years of trouble-free service.

Bulletins and engineering data are available to Architects and Engineers from Chicago Pump Company or its Distributors located in most principal cities.

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Chicago Pump Company

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NEW LOW SILHOUETTE FANDAIRE AIR-COOLED CONDENSERS

ALWAYS FACED RIGHT —NO MATTER WHAT THE WIND DIRECTION

No need to position circular Fandaire Air-Cooled Condensers to meet prevailing winds. Just set it anywhere for easiest piping.

Exclusive Aimco fintube design provides high-heat dissipating efficiency for circular Fandaire condensers.

Here's the newest, most advanced air-cooled condenser on the market—Fandaire! This modern low silhouette condenser is engineered around a new high-heat dissipating fintube of exclusive design and manufacture. In operation, the entire spiral of fintubing is surrounded with a circle of swiftly moving cool air for highest cooling efficiency. Every degree in temperature drop is fully utilized as this circular design captures the wind from *any* direction, regardless of placement or location. A powerful fan pulls cool air in and pushes warm used air up and away. Fandaire's constant gravity tube drainage gives continuous movement to condensate.

With its low, clean-lined silhouette, Fandaire does not detract from the general architectural effect of the building. And weighing ⅓ less than conventional installations, the Fandaire usually can be positioned where needed, without guy wires or extra bracing. Savings in piping and installation alone may be considerable.

Where there is a problem of architectural compatibility, or of cost or performance, chances are the new Fandaire Air-Cooled Condenser is the best solution. Engineered in sizes from 3 to 120 tons per unit, there is a Fandaire model for practically all single or multiple installations. Get complete information today.

YUBA

specialists in circular air-cooled condensers

YUBA-AIMCO DIVISION

801 West 21st Street, Tulsa, Oklahoma

YUBA CONSOLIDATED INDUSTRIES, INC.

Sales Offices in Atlanta • Buffalo • Chicago • Cleveland • Houston • Los Angeles • New York • Philadelphia • Pittsburgh • San Francisco • Seattle

This architect's rendering shows the new Day Building on Mt. Olympus, Syracuse University. Economical heating comfort is maintained in this, and two other new Syracuse dormitory multi-zone units controlled by Sarcotherm hot water control systems. Architects: King & King, Syracuse. Engineers: Robson & Woese, Inc., Superintendent of Buildings & Grounds, Syracuse University. E. J. Gibbons, Mechanical Contractors (on the Day Building, above, and Sadler Hall) Edward Joy Company, Syracuse, N. Y., (on the women's dormitory) Mechanical Installations Inc., Ozone Park, N. Y.

FOUR-YEAR PERFORMANCE RECORD LEADS TO 15-ZONE INSTALLATION OF SARCOTHERM HEATING CONTROLS

In 1956 Syracuse University installed a Sarcotherm hot water heating control system in an 8-zone dormitory project. Now four years of flawless operation have demonstrated the ability of the Sarcotherm system to deliver complete control of heating comfort – without any maintenance or repair of any kind. As a result, two new Syracuse dormitories have been built with Sarcotherm systems for a total of 15 zones Sarcotherm-regulated.

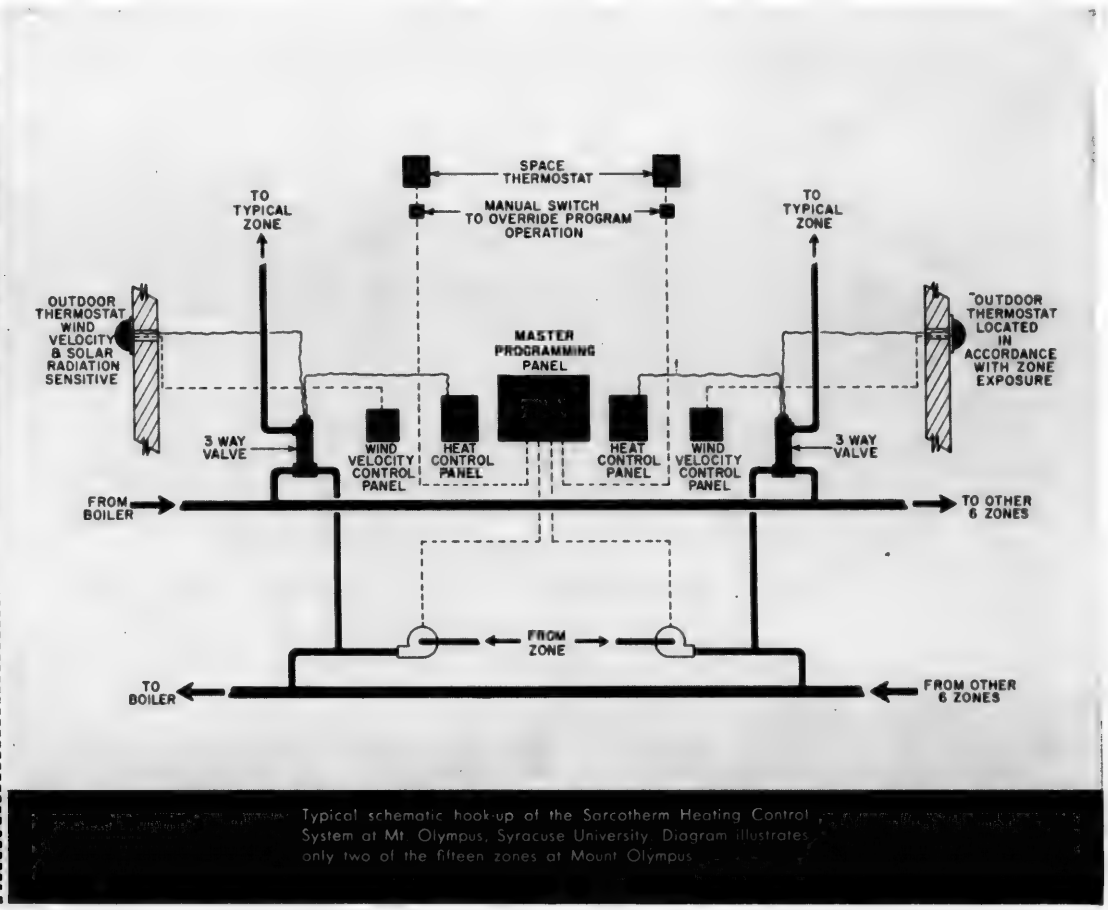
In each zone, Sarcotherm provides precise temperature control, fully allowing for occupancy and exposure, obviating the need for costly individual room control. The Sarcotherm system features a three-way valve controlled by an outdoor thermostat, which is highly responsive to temperature changes, solar radiation and wind load. In addition to this method of anticipating weather before it makes its effect felt indoors, the Sarcotherm system utilizes a master indoor control in each zone, which starts to cool the system as correct temperature is being reached.

This absolutely prevents overheating and prevents wasting fuel. All controls are sealed and are tamper-proof.

SARCOTHERM CONTROLS

Sarcotherm Controls, Inc., an affiliate of Sarco Company, Inc.

635 Madison Avenue, New York 22, N. Y. • Plant: Bethlehem, Pa.



Typical schematic hook-up of the Sarcotherm Heating Control System at Mt. Olympus, Syracuse University. Diagram illustrates only two of the fifteen zones at Mount Olympus.

. . . AND BASIC SIMPLICITY OF RUGGED SARCOTHERM CONTROLS SPEEDED INSTALLATION AND ADJUSTMENT

Fewer parts and uncomplicated wiring greatly simplify Sarcotherm installations. In addition, Sarcotherm unit-packed and tagged every component, prepared complete working drawings, and keyed all parts of these drawings. This substantially reduced installation time. On-the-job cooperation by trained Sarcotherm personnel contributed to the speed and efficiency of the work.

Sarcotherm personnel always make final adjustments and take the system through start-up. Sarcotherm provides complete operating manuals and gives personal instruction to all operating personnel.

In these three modern dormitories, Syracuse University has a control system free of maintenance problems. All of these projects profited from the simplicity of Sarcotherm design and the thoroughness of the installation methods, developed through more than 20 years of specialized experience.

1331

* *FOR COMPLETE CONTROL SYSTEM CATALOG* write Sarcotherm Controls, Inc., 635 Madison Ave., New York 22, N. Y.

SARCOTHERM CONTROLS

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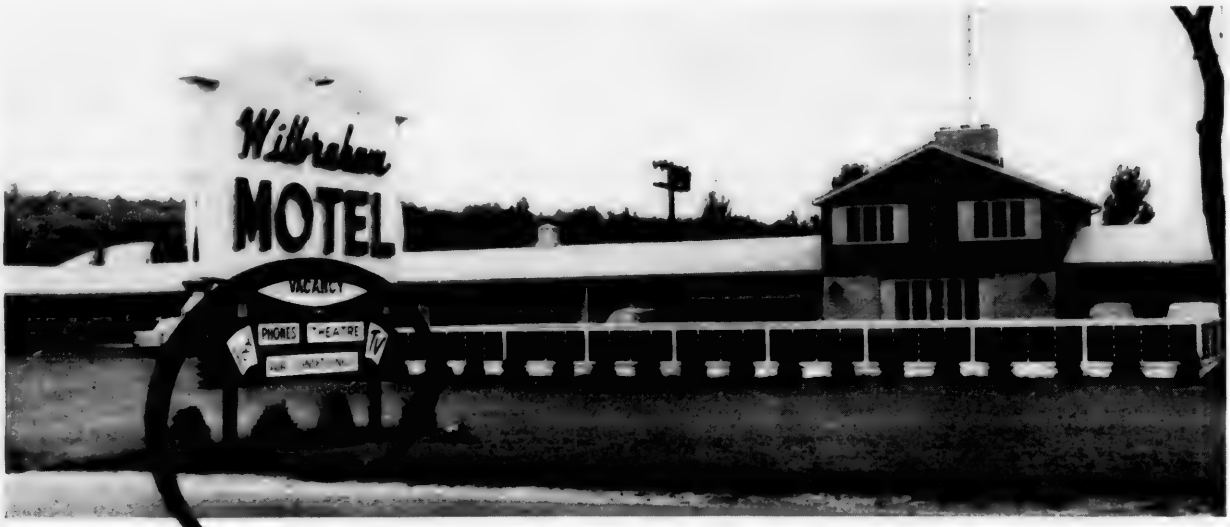
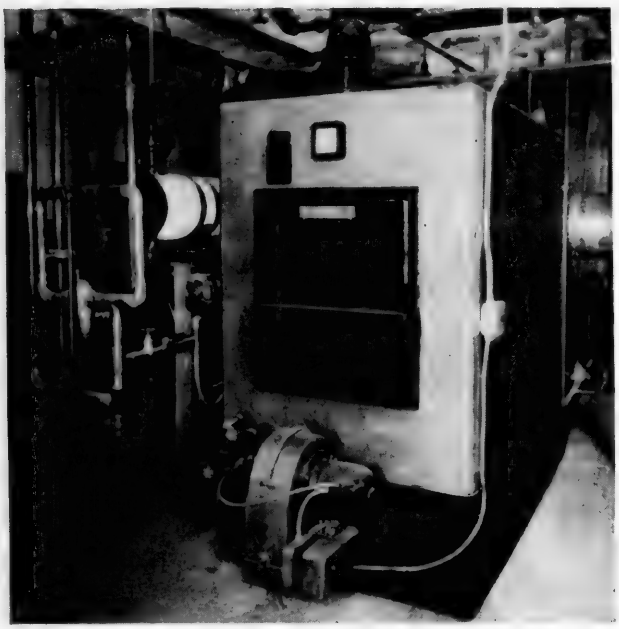


Wilbraham Motel, U.S. 20 and Boston Road, Wilbraham, Mass.

EVERYTHING FOR LUXURY TRAVEL...
INCLUDING DEPENDABLE HEATING WITH A

WEIL-McLAIN No. 82 BOILER-BURNER UNIT



No. 82 Capacities: Hot Water, 339,100—793,700 BTU/hr. Steam, 1415—3305 sq. ft.

Send for bulletin C-270. For other Weil-McLain Gas and Oil Boilers see Engineers' Product File or Sweet's Architectural File.

OWNER: Mr. Clarence Potvin **MANAGER:** Mr. Roland E. Duris
DESIGNER: Mr. Philmore H. Colburn, Springfield, Mass.
ENGINEERS AND HEATING CONTRACTORS: Caron Heating Company, Ludlow, Mass.

This ultra-modern, 24-unit motel includes lounge, kitchens and owner's apartment. It offers outstanding convenience and entertainment features...plus the genuine comfort of a hot water heating system supplied by a Weil-McLain No. 82 boiler-burner unit.

In this rugged, cast iron boiler, exclusive Weil-McLain designs assure the efficient combustion of fuel and absorption of heat. No. 82 Boilers are available as "B" units, furnished with burner, combustion chamber and controls —as "A" units, with combustion chamber and flange-mounted base front only—and as "O" units with rectangular opening in base front, no burner or combustion chamber. Easy assembly with short draw rods and asbestos rope seal reduces erecting costs.

In the installation shown here, an indirect heater with pumped boiler water circulation is used to supply the unusually heavy hot water demands of the motel rooms and kitchens. For normal loads, a special feature of the No. 82 boiler permits installation of single or double domestic water heaters. Dual heaters offer a choice of three advantages: (1) increased volume of hot water, (2) hot water at two different temperatures, (3) one heater for snow melting.

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BOILERS · RADIATORS

WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

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SPORLAN Famous Firsts...

...for Peak Performance Air Conditioning!

Sporlan *Catch-All*... the first molded porous core filter drier... Sporlan's amazing *See-All* the first combination moisture and liquid indicator... Sporlan Solenoid Valves with the layer wound Blue Seal Coil... Sporlan Thermostatic Expansion Valves with the original *FLOW MASTER* element and Refrigerant Distributors with the versatile interchangeable nozzle...

offer **You** *a perfect combination engineered to fit any size installation... right down the line!*

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The new United States Air Force Academy perched at 7,200 feet above sea level near Colorado Springs and Pikes Peak.

AT THE U.S. AIR FORCE ACADEMY

GAS-operated CARRIER ABSORPTION REFRIGERATION PROVIDES TROUBLE-FREE, ECONOMICAL COOLING

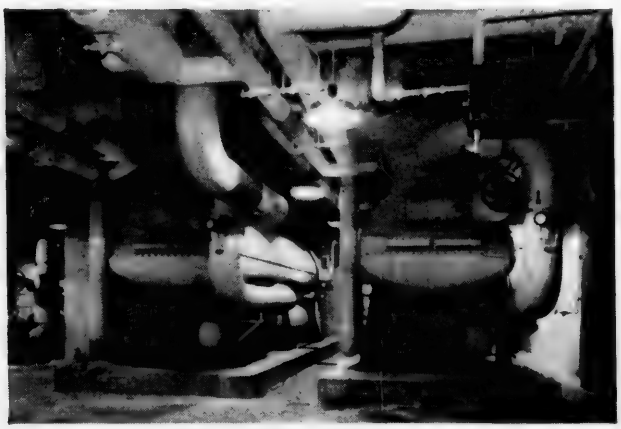
To provide comfort cooling, the new U. S. Air Force Academy is equipped with one of the most efficient, up-to-date, economical types of systems available today – gas-operated Carrier Absorption Refrigeration.

The absorption refrigeration unit makes use of one of the oldest and most reliable principles of refrigeration. No prime mover is required, only low-pressure steam or hot water. Seasonally idle or excess boiler capacity can be put to use on a year 'round basis.

This same type of automatic operation can put your heating system on a year 'round paying basis, too!

With gas as the boiler fuel, operating costs are cut to a minimum. This Carrier machine operates without noise and vibration . . . and because it is so compact and lightweight, it can be put almost anywhere – from basement to roof.

This is only part of the story of the efficiency and economy of specifying gas-operated Carrier Automatic Absorption Refrigeration equipment. Specific performance, engineering data and cost details are yours for the asking. Just call your local gas company, or write to Carrier Corporation, Syracuse 1, New York.
American Gas Association.



Gas-operated Carrier Automatic Absorption Refrigeration

- cuts operating expense
- lowers installation cost
- provides quiet, vibrationless operation
- answers space and weight problems
- automatically adjusts to varying loads

Architects: Skidmore, Owings & Merrill

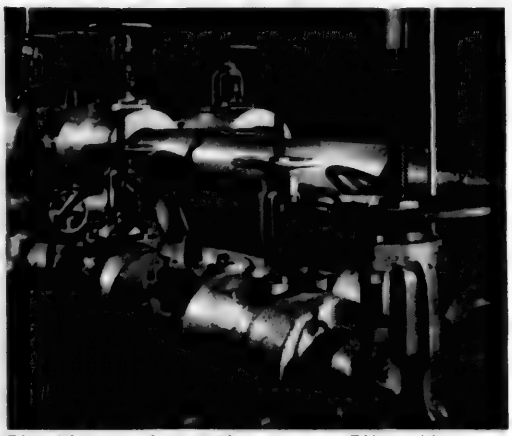
Founder Melville R. Bissell surely would have chosen JENKINS VALVES for BISSELL's NEW HOME

PLANT OWNED BY BISSELL, INC., GRAND
MICHIGAN, IS AS LONG AS 3 FOOTBALL FIELDS.
Architects & Engineers: J. & G. DAVERMAN CO.
Gen. Contractor: BECKERING CONSTRUCTION CO.
Mech. Contractor: VANDER WAALS-TROSKE CO.
GUARANTEE
The name "Bissell" on this product assures you that it will perform efficiently and satisfactorily in every way — or we will make it so. When you buy a Bissell, you buy the best.
BISSELL Inc.
A Fair Offer
If you will put a Jenkins Valve, recommended for your particular service, on the worst place you can find — where you cannot keep other valves tight — and if it is not perfectly tight or it does not hold steam, oil, acids, water or other fluids longer than any other valve, you may return it and your money will be refunded.
Jenkins Bros

Almost a century ago two men established different kinds of businesses, one to make a revolutionary carpet sweeper and the other to produce the first valves with a renewable seat. Both of these pioneers began with the same firm determination: To make the finest product of its kind, so reliable that it could safely be backed by the strongest kind of written assurance of satisfaction.

The companies founded by Melville R. Bissell and by Nathaniel Jenkins still operate under that same high principle. Their names have become the most trusted in their markets.

Just as housewives seeking the best in cleaning products demand BISSELL, plant and building owners, architects, engineers and contractors wanting maximum reliability in valves commonly specify JENKINS. Valves for practically every need are made by Jenkins Bros., 100 Park Ave., New York 17.



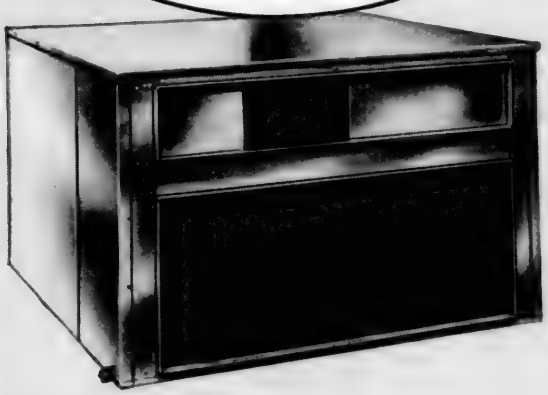
Bissell's valve installation employs 748 Jenkins Valves of bronze and iron, sizes from ½" to 12".

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864
Jenkins Bros

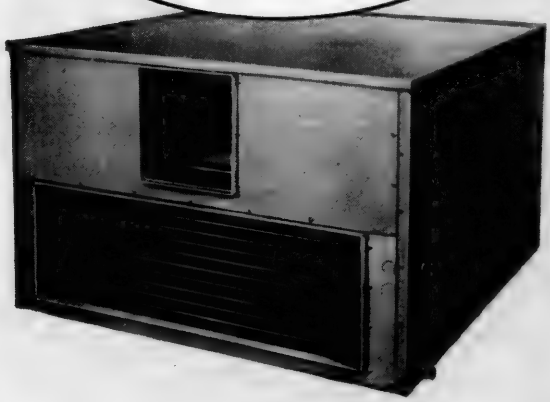
Sold Through Leading Distributors Everywhere

Now YORK Goes "Twin System" Across the Board!

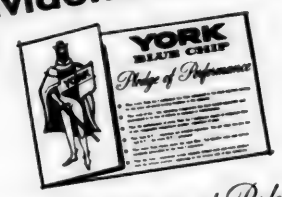
NEW Twin-Line Air Conditioner



NEW Twin-System Heat Pump



YORK Blue Chip Dividend for '60



EXCLUSIVE *Pledge of Performance*

Offers the most rewarding sales and profit opportunities in air conditioning today!

Gives You More to Sell More to Tell in 1960!

You've already enjoyed the sales wallop of selling York Twin-System central air conditioners against single systems! Now comes a York Twin-System heat pump for central heating and cooling! That means 2 separate cooling systems *plus* 2 separate heating systems! One system operates under normal conditions; the second swings into action automatically under extreme conditions. You can stress fact that customers pay only for the cooling or heating they need...save 15% or more on operating costs.

York Puts More Into Every Unit, So You Get More Out of It!

YORK

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BORG-WARNER RESEARCH & ENGINEERING MAKE IT BETTER

Air Conditioning, Heating, Refrigeration and Ice-Making Equipment • Products for Home, Commercial and Industrial Installations

MAIL COUPON

General Sales Manager
Packaged Products Div. AHV-3
York Corporation
York, Pennsylvania

I'm interested! Send me full details on 1960 York Twin-System Residential Units and new Blue Chip Pledge of Performance.

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Engineered to

RETAIN YOUR PRODUCT LEADERSHIP

Alco Designed
CONTOUR POWER ASSEMBLY
Increases power element life as much as 10 times over other designs by reducing extreme flexing of the diaphragm. Standard construction on all ALCO T Series and HT1 Series.

Alco Designed
RAPID RESPONSE REMOTE BULB AND WELL
- Reduces danger of floodback
- Extra quick closing response
- More efficient control over wider range of operating conditions
- Economical to install in package units
- Available on all Alco Gas Charged Valves when specified

Alco Designed...
for easy capacity changes or cleaning without breaking connections or removing valve from line. Simply loosen 2 bolts, lift out cartridge, clean and replace.

ALCO T-SERIES
*THERMO EXPANSION VALVES

• **Refrigerants: FREON-12 from ½ ton to 50 tons, FREON-22 from 1 ton to 80 tons, CARRENE-7 from ¾ ton to 60 tons, PROPANE from 1 ton to 88 tons • 2 BODY DESIGNS meet every requirement—STRAIGHT THRU CONNECTIONS or RIGHT ANGLE CONNECTIONS • WIDE VARIETY OF CONNECTIONS (Outlets to match distributor requirements • EXTERNAL or INTERNAL EQUALIZER • EXTERNAL or INTERNAL SUPERHEAT ADJUSTMENT • TIGHT SEATING . . . STAINLESS STEEL STEM AND SEAT • CORROSION-RESISTANT MATERIALS • MOUNT IN ANY POSITION • NO SPECIAL WRENCHES or GUIDES REQUIRED FOR CLEANING AND SERVICING**

Call your ALCO WHOLESALER—Write for Bulletin 171-56

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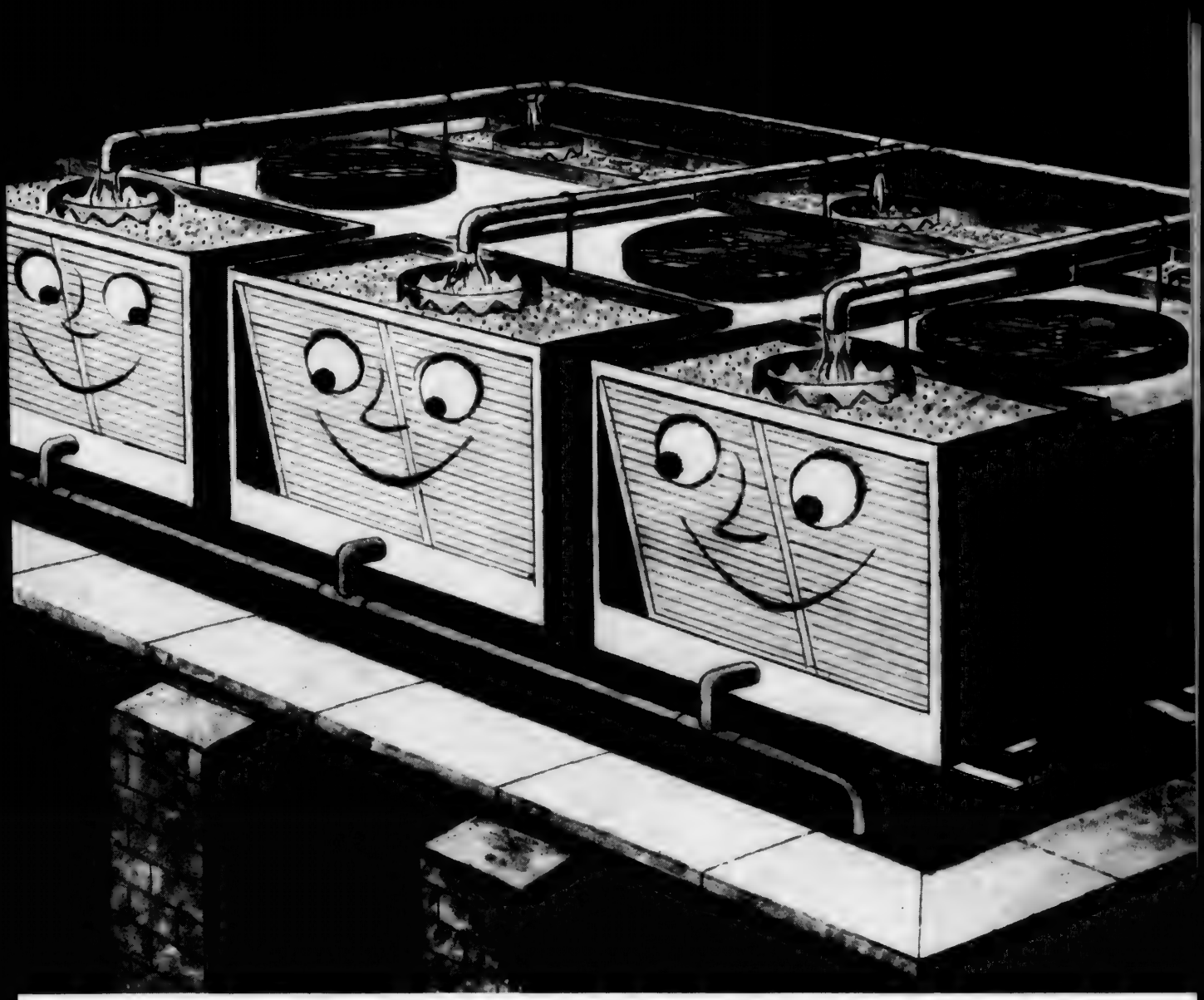
The one complete line of refrigerant controls: Thermostatic Expansion Valves · Refrigerant Distributors · Solenoid Valves · Suction Line Regulators · Flooded Evaporator Controls and Reversing Valves



How to cut costs on a 450-ton cooling job:

Use three Halstead & Mitchell 150-ton cooling towers!

H&M MODEL EC-150 COOLING TOWER
WITH 10-GAUGE STEEL CABINET

How can three units be cheaper than one? Simple. Halstead & Mitchell packaged cooling towers come to you completely assembled and therefore less expensive to install. They operate at lower cost because there can be no wasted capacity; with step-control, you get capacity as you need it.

Furthermore, with "modular" units, you can place each tower near the equipment it's to be used with. This gives you closer control of water temperatures—another economy factor. Then, too, if one tower must be shut down, you can continue to operate the others.

The advantages go on and on: lower silhouette, lower rigging costs, and utmost flexibility—towers can be easily moved or supplemented as requirements change. And, like all H&M towers, these carry the exclusive 20-Year Guarantee on the wetted deck against failure due to fungus attack or rotting.

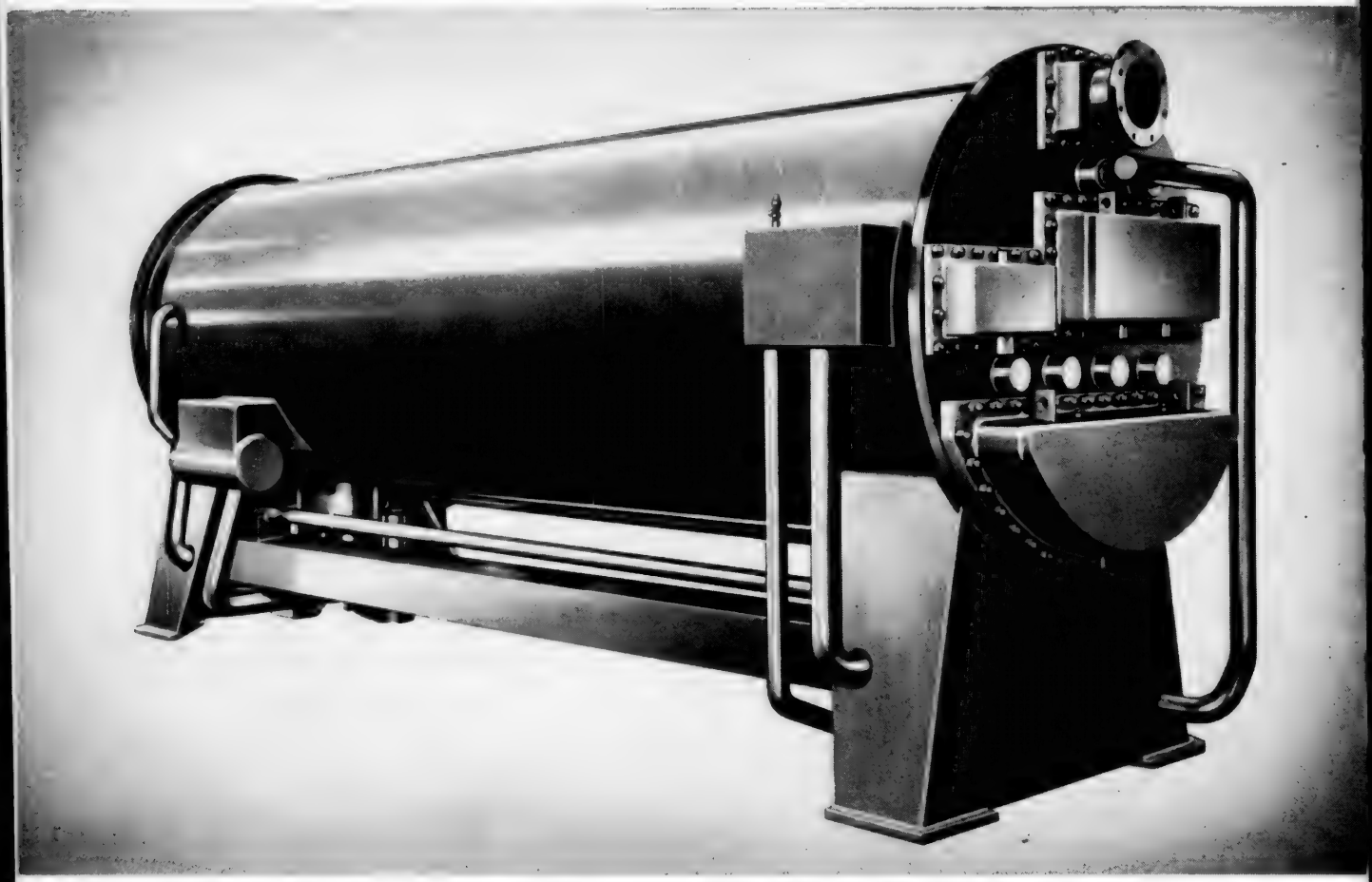
Contact your Halstead & Mitchell distributor for complete information on H&M cooling towers in 3- to 150-ton capacities. Or write Halstead & Mitchell Co., Bessemer Bldg., Pittsburgh 22, Pa.

HM

Halstead & Mitchell

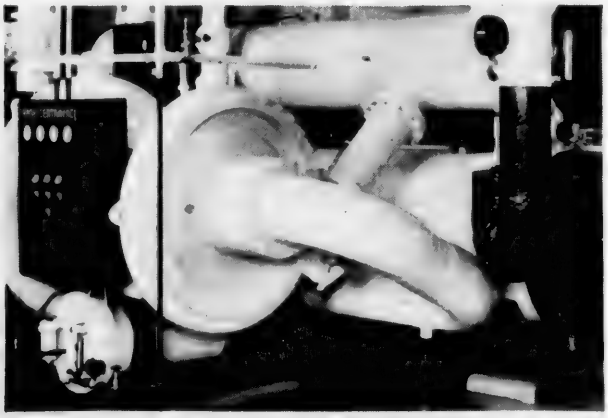
Cooling Towers • Water-Cooled Condensers • Air-Cooled Condensers • Finned Coil Products • Air-Handlers

Now! Low-cost industrial Trane Hermetic

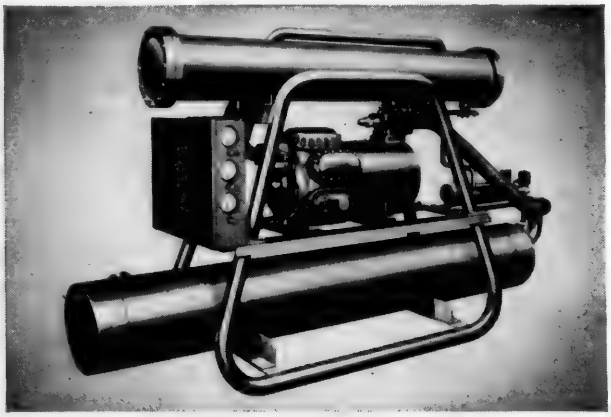


For industrial process cooling or comfort air conditioning—wherever there is a supply of low-cost steam—the new TRANE Absorption Cold Generator is available in nine sizes, 100 to 350 tons . . . making it easy to select a unit to match the exact requirements; means fuel savings and efficient part load operation.

There's Trane matched equipment for every air conditioning need...



Hermetic CenTraVac water chiller with electric drive modulates to 10% of capacity, or lower, with power savings in almost direct proportion to load. Compact, with low silhouette design. Open type compressor models for any type of drive and steam turbine CenTraVacs are available.



New Reciprocating Cold Generator now hermetic—with TRANE built chiller and condenser. Provides efficient water chilling for a wide variety of applications. Factory-wired control panels mounted on unit to eliminate on-the-job wiring. Features new TRANE Hermetic Reciprocating Compressor.

water chilling...with a Absorption Cold Generator

Advanced hermetic design, single-shell construction provide simplified installation, minimum maintenance, economical operation for process or comfort cooling

Here's a compact packaged hermetic absorption water chiller—the TRANE Absorption Cold Generator. It's designed to provide a dependable, economical source of chilled water for process or comfort cooling in industrial plants, hotels, apartments and office buildings—wherever there is a supply of steam or hot water.

The advanced *hermetic* design assures reliable operation under all operating conditions . . . prevents air from entering the system which causes crystallization, deterioration and maintenance problems. The machine operates under conditions which avoid crystallization. (If power failure or other temporarily abnormal conditions occur, the machine will tend to free itself of any resulting crystallization.)

Fully automatic operation means no full time attendant is needed. The unit responds immediately and automatically to changing load requirements. Its design provides maximum efficiency under full and partial load conditions—results in low power consumption, economical operation. And the new Absorption Cold Generator is *quiet*, vibration-free—may be located anywhere without sound-proofing the area. Single-shell construction reduces overall size, permits installation in areas with low ceilings. Factory-assembled and wired, it has been designed to effect substantial savings in installation time and costs. Nine sizes from 100 to 350 tons permit selection of a unit to match the exact cooling requirements.

The TRANE Company has extensively tested and proven this new *hermetic* absorption water chiller design assuring dependable, economical water or other liquid chilling for a wide variety of applications; and it will minimize operation and maintenance problems.

WANT MORE FACTS? For complete information on the new TRANE Hermetic Absorption Cold Generator, just call your nearby TRANE Sales Office; or write TRANE, La Crosse, Wisconsin.

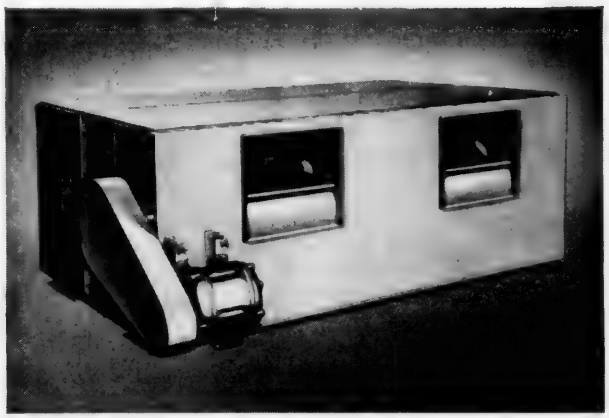
For any air condition, turn to

TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA. • CLARKSVILLE MFG. DIV. CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA, LIMITED, TORONTO • 100 U.S. AND 10 CANADIAN OFFICES

New Heat Pump is compact, efficient, designed for in-the-room or remote installation. 3 to 15-ton capacities for industrial or commercial applications. Easily accessible piping and connections simplify installation. Compact water to air unit takes little floor space. Refrigeration cycle removable.



New Climate Changers heat, cool, ventilate . . . solve a wide variety of application problems. Single-zone and multi-zone units that supply different air conditions for as many as 14 zones at the same time. New design features reduce overall costs. 1200 to 47,000 cfm.

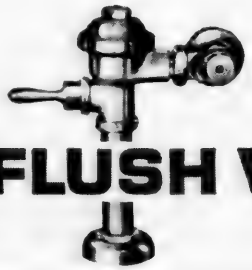
You pay no more for unequalled SLOAN quality...

Sloan Flush Valves Save Water

•Water is scarce in many parts of the country and it costs money—and costs often rise when it must be pumped within a building to distant branches and upper floors. You can save both water and money when you specify the Sloan ROYAL Flush Valve.

In the ROYAL, there are <u>two</u> water-saving features providing maximum water economy—(1) "non-hold-open," which prevents the waste of water accidentally or maliciously and (2) "no regulation," which means there is no regulating screw to get out of adjustment. These are the two most important features of modern flush valves and, as standard equipment, only the ROYAL has both.

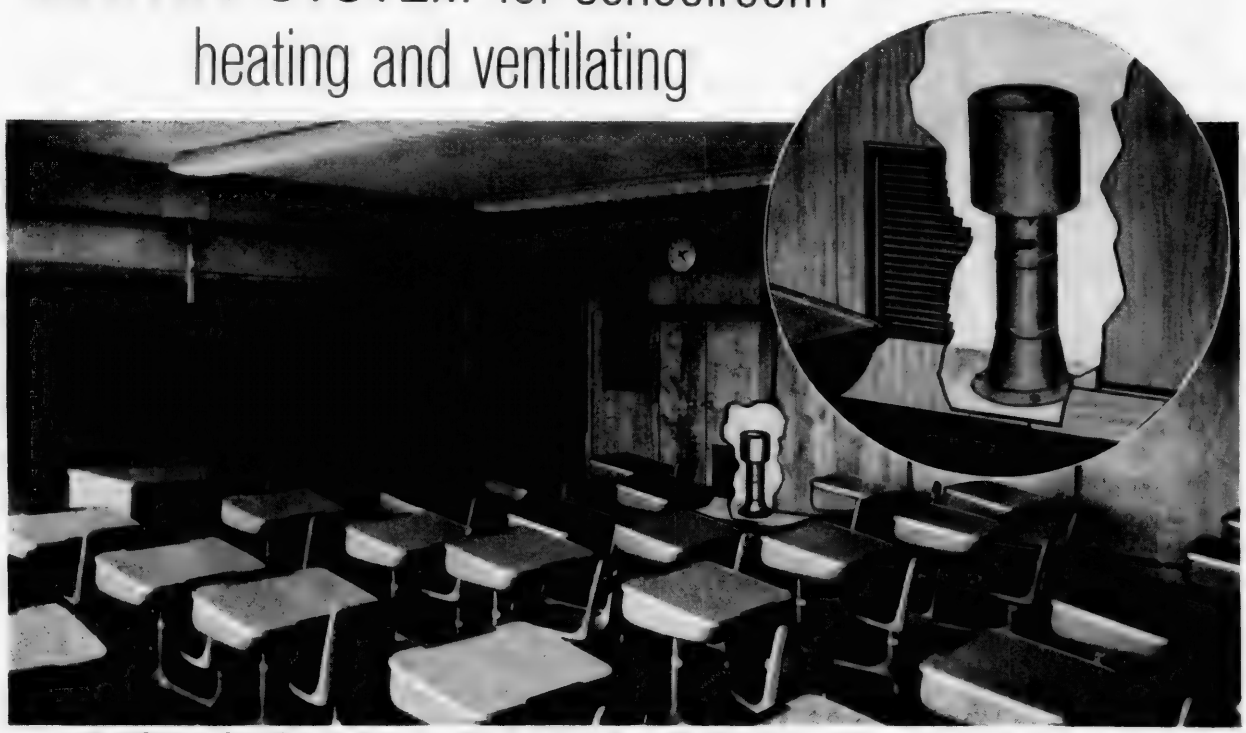
This exclusive combination of features is another example of that bonus of quality you expect from Sloan. And since you can have Sloan quality at no extra cost—why not make sure you get it.



SLOAN FLUSH VALVES

SLOAN VALVE COMPANY • 4300 WEST LAKE STREET • CHICAGO 24, ILLINOIS

VARI-AIR SYSTEM for schoolroom heating and ventilating



Holy Family Elementary School, Fulton, N. Y.
Pastor: Rev. Edward C. Hearn
Architect: Edward Roock, Syracuse, N. Y.
Contractor: Kenneth A. Taylor, Inc., Syracuse, N. Y.

MECHANICAL INSTALLATION @ $1.36 per sq. ft.

Vari-Air, a "split system" which handles ventilation requirements by a separate Vari-Air unit in each room, combined with Vari-Vac automatic temperature control system, provide a dozen plus features for new schools such as Holy Family Elementary School in Fulton, N.Y.

Foremost is the achievement of satisfying a basic concern of school planners everywhere . . . cost, without elimination of any design requirements. Citing actual facts, not general claims:

1. At Holy Family Elementary School, heating and ventilating cost was $1.36 per sq. ft. compared to 23,520 sq. ft. gross building area cost of $11.59 per sq. ft. This $1.36 figure represents considerably lower installation expense and amounts to a sizable saving on the aggregate.

Other advantages, important to school planners, include:

2. More free floor area per room.

3. Quick morning heat-up.

4. Designed percentage of fresh air to recirculated air guaranteed regardless of outside temperature change.

5. Complete flexibility of individual room temperature.

6. Elimination of classroom overheating due to student heat gain or sun heat gain.

7. Complete automatic control of heat input to schoolrooms through variation of steam temperature and volume, to agree with outside temperature change demands.

8. No down drafts from cold windows.

9. No drafts from air circulation.

10. No mechanical noise or mechanical maintenance requirements in schoolrooms.

11. Lower decorating costs through slight pressurization of buildings.

12. No technical training of maintenance personnel necessary.

Vari-Vac and Vari-Air systems, manufactured by Dunham-Bush, illustrate the advantages of a single source and delegating a single manufacturer responsibility. For instance, Dunham-Bush products at Holy Family Elementary School include: Vari-Air units; Radiation; Duplex Vacuum Pump with Differential controllers; air handling unit; Vari-Vac temperature controls; Steam Specialties including float and thermostatic traps, strainers, oriflex valves, and orifice plates.

If you're planning a new school or modernization, write for full details on Vari-Air and Vari-Vac.

Only Dunham-Bush can give you the advantages of a Vari-Air system.

Dunham-Bush, Inc.

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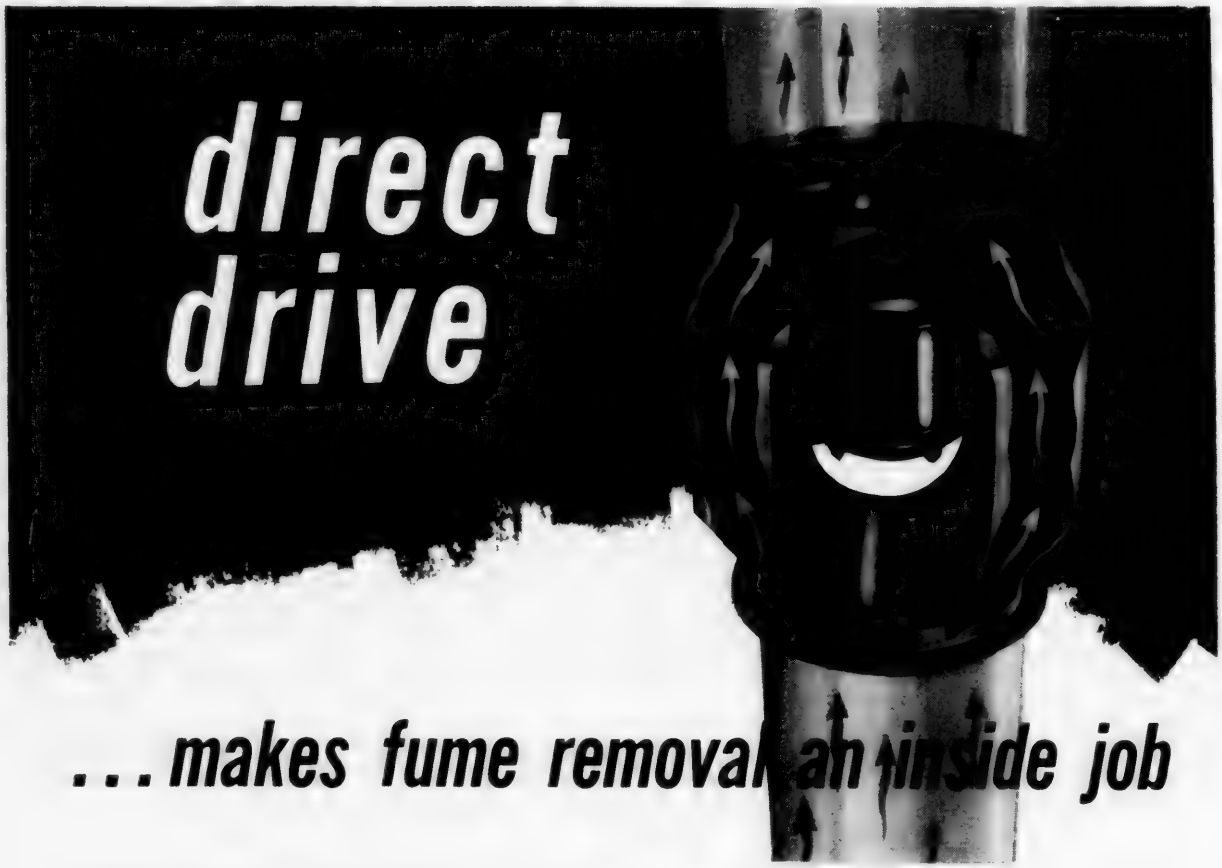

. . . makes fume removal an inside job

Installed directly in ductwork, space-saving DeBothezat Bifurcator Fans provide efficient direct drive power for fume removal.

Damaging fumes are kept away from the motor by a housing of acid-resistant metal alloy or of steel protectively coated with PVC (plasticized polyvinyl chloride) and many other types of synthetic linings. Fan wheels in a complete size range can also be made with similar anti-corrosion protection.

Save Installation Dollars

Installing a DeBothezat Bifurcator Fan is about as quick and simple as putting in a section of ductwork. Direct drive eliminates recurring maintenance problems. From space-saving installation to long-term operating economy, DeBothezat Bifurcator Fans keep costs down all the way. For detailed specifications on Bifurcator Fans, contact a DeBothezat Sales Engineer or write direct. Address Dept. ACH-360.

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A DIVISION OF

American Machine and Metals, Inc.

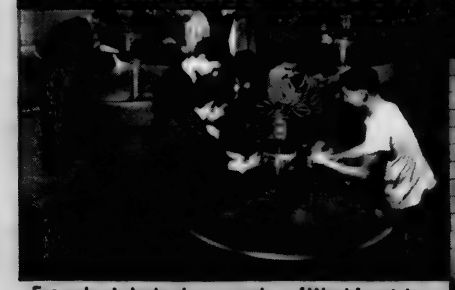
EAST MOLINE, ILLINOIS

EASILY INSTALLED AS A PART OF DUCT . . . INDOORS OR OUTDOORS.

IN CANADA Represented by DOUGLAS ENGINEERING CO. Ltd., Toronto—Montreal

Where do you want to place your Bradley Washfountains?

IN ONE LARGE WASHROOM?



Example of placing large number of Washfountains in large washrooms—one for boys and another for girls.

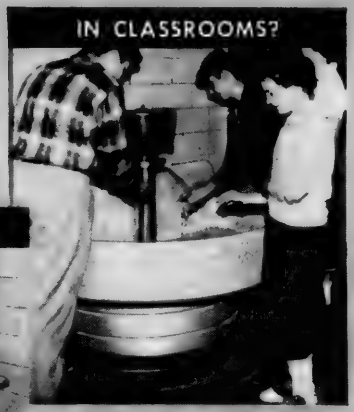
IN CORRIDORS OR ALCOVES?

Some prefer placing Washfountains in corridors near toilets. In one-story buildings covering considerable ground area—several of such installations may be placed in two or more locations.

Full circle model 54-in. and 36-in. diameter —three materials; precast stone, stainless steel, vitreous enamel pressed steel.

Semi-circular model—sizes and materials as full circular models.

IN CLASSROOMS?



To provide handy washing facilities additional Washfountains (semi-circular models in this case) are located in classrooms, workshops, laboratories.

NEAR OR IN CAFETERIA?

Outside the entrance to the cafeteria, two Washfountains provide ample sanitary washing facilities in this grade school.

IN VARIOUS LOCATIONS IN BUILDING?

These two Semi-circular Washfountains were added here in hall adjacent to the school cafeteria.

Widely used in schools of every size

In the educational field—high schools, elementary schools, colleges and institutions—Bradley Washfountains are installed in a great variety of locations. School authorities, architects and consulting engineers have recognized the economy and ultra-sanitary features that these group type, foot-controlled wash fixtures provide.

There are no faucets to manipulate or maintain, no chance of collection of contaminating water in the big bowl since it is self-rinsing—and real economy of installation—*one set* of plumbing connections suffices for each *8 to 10* person Washfountain. And they cut washup time.

For new buildings and remodeling you can get both economy and the maximum in safe sanitary wash facilities with Bradley Washfountains . . . To have all necessary details write today for free copy of new Catalog 5601 to BRADLEY WASHFOUNTAIN CO., 2352 West Michigan St., Milwaukee 1, Wis.

THE SMALL WASHFOUNTAIN

has the same sanitary features—no faucets, foot control and self-rinsing bowl.

They are installed wherever washing facilities are required—in small washrooms, corridors, art classrooms, first aid rooms, science laboratories, faculty and visitors' rest rooms.

Bradley

BRADLEY *washfountains*

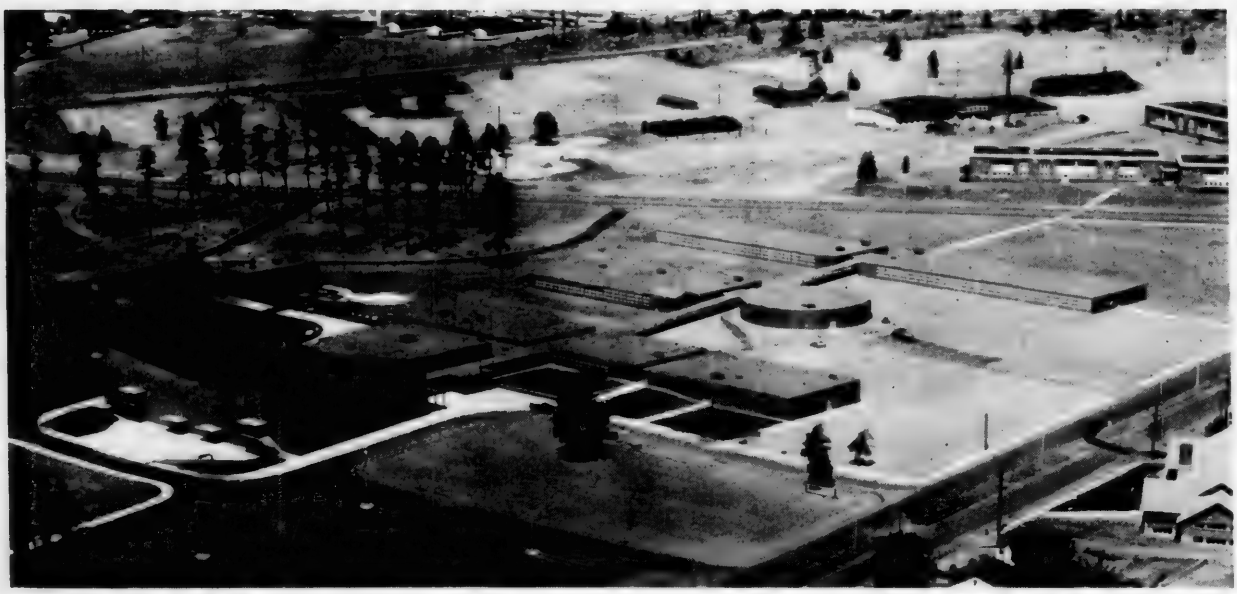
Write for Catalog. No Obligation.

How the boiler room of the Hudson Bay High School also serves the school across the street

And a neighborly boiler room it is! From it, 100,000 feet of USS National Pipe, in the form of steam heat, plumbing, air and fuel lines, serves not only the Hudson Bay High School, Vancouver, Washington, but is used to pipe steam across the street to a vocational school, too. USS National Pipe in sizes from ½-inch through 12 inches was used.

Do you need quality pipe for power, heating and air conditioning installations? You'll get it when you ask for USS National Steel Pipe. If you'd like further information, or immediate assistance with your pipe problems, write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and National are registered trademarks



Plumbing & Heating Contractor: Longview Plumbing & Heating Company. Mechanical Design: J. Donald Krocker & Associates, Consulting Engineers.

The world's largest and most experienced manufacturer of tubular products.

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United States Steel Export Company, New York

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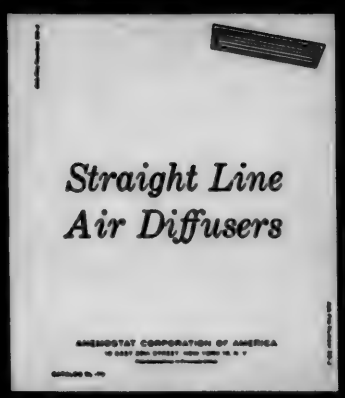
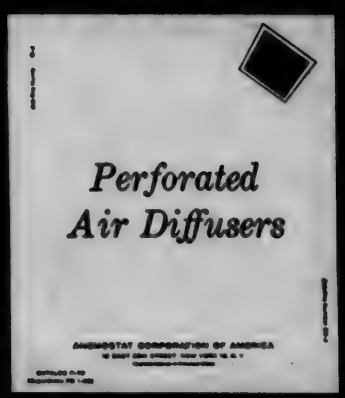
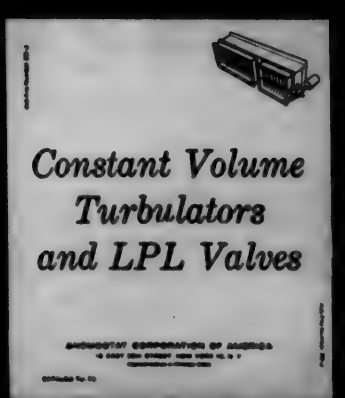
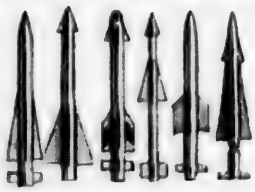


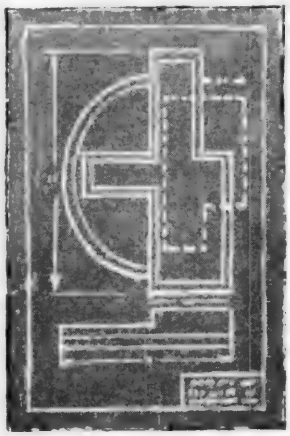


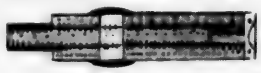


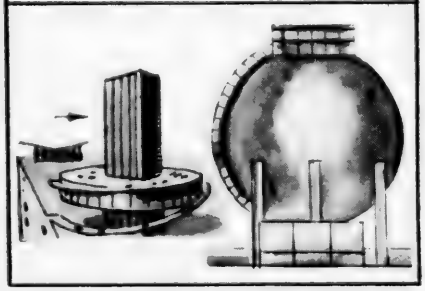
LOOK TO LAWLER FOR TOMORROW'S DESIGN IN THERMOSTATIC CONTROLS ..... KNOW-HOW KEEPS US AHEAD!

Recesso









. . . symbol of Lawler's "years ahead" designing that brings you industry's most advanced, consistent thermostatic control.

Lawler engineers have spent the greater part of a half century solving difficult temperature control problems.

In the years to come, Lawler experience and engineering leadership will set the pace in thermostatic control valves.

LOOK TO LAWLER FIRST!

LAWLER AUTOMATIC CONTROLS, INC.
Mt. Vernon, N. Y.

He's also cutting costs ... with G-B SNAP*ON® pipe insulation

When applying insulation around obstructions, try this "short-cut": simply use G-B SNAP*ON, the one-piece pipe insulation molded of fine glass fibers. In just a matter of seconds, G-B SNAP*ON can be "tailor-cut" to fit snugly, neatly around runouts, feeders, valves, fittings, etc. And unlike brittle, rigid-type insulation materials that crack and break, G-B SNAP*ON is highly resilient . . . less susceptible to damage during installation. You'll be amazed, too, at how fast you can insulate straight runs, because 3′ and 6′ sections of G-B SNAP*ON snap over pipe in one quick, simple motion.

Add to these advantages the permanence and superior thermal efficiency of G-B SNAP*ON, and you can readily understand why it is industry's No. 1 choice for heated or cold lines. It's available from local stocks . . . plain or with a variety of facings for hot or cold lines, indoors or out . . . in sizes from copper tubing to 36″ IPS.

FOR INFORMATION & PROMPT DELIVERY SEE YOUR G-B SNAP*ON DISTRIBUTOR (LISTED IN THE YELLOW PAGES)

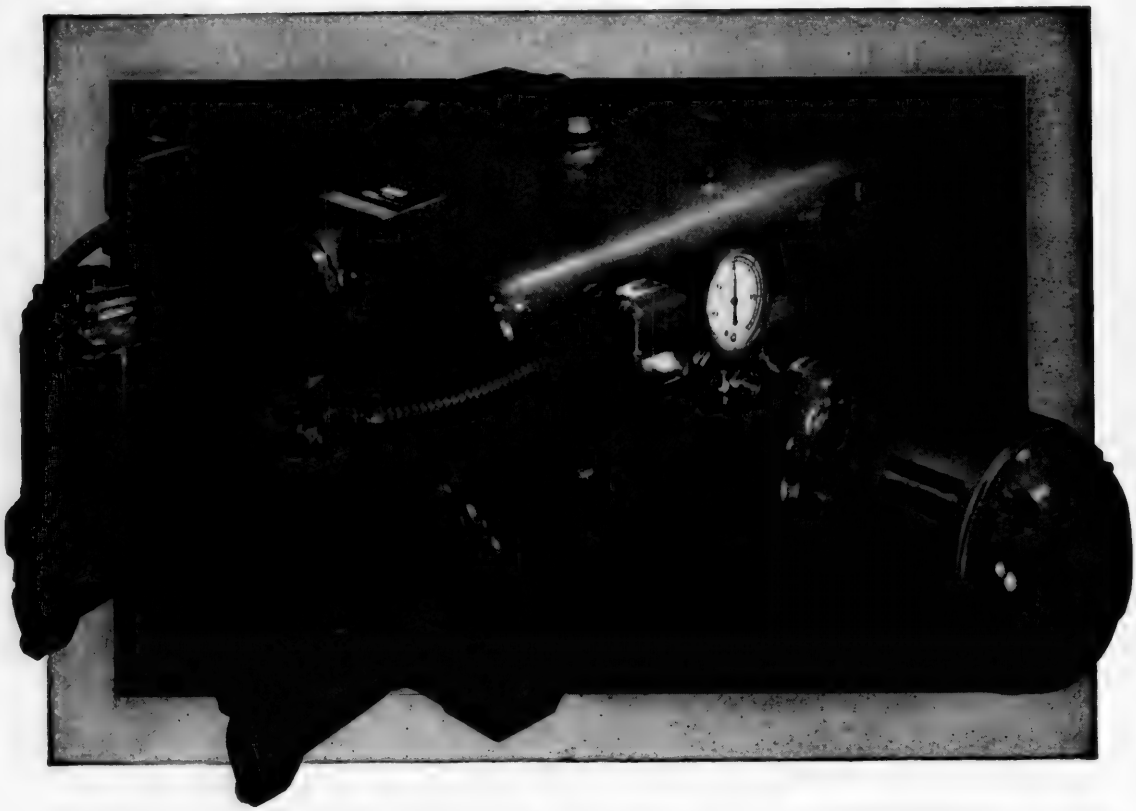
GUSTIN-BACON *Manufacturing Co* GUSTIN gb BACON®

222 W. 10th St., Kansas City, Mo.

Thermal and acoustical glass fiber insulations . . . molded glass-fiber pipe insulation
Couplings and fittings for plain and grooved end pipe

THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
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SPLIT SYSTEMS FOR COMFORT

The author explains how to combine hot water and warm air heating to produce the economical split system for comfort air conditioning. "Were all other benefits of the use of the split system to be negligible," the author states, "the greater comfort for personnel occupying the space would fully warrant installation of such a system."

Above, newly constructed Dearborn, Michigan office of Manufacturers National Bank employs split system for year-round air conditioning. Cool air from overhead is supplied in summer, warm air in winter. Finned pipe radiation under windows and on exterior walls provides additional heating in winter. The one-story building contains 10,700 sq ft and makes liberal use of glass, aluminum, and stainless steel. At left are drive-up banking windows.

S. A. LITTMANN
Chief Mechanical Engineer
Giffels and Rossetti, Architects and Engineers
Detroit, Michigan

THE TRANSITION from steam and hot water radiation to air for heating systems has been greatly accelerated by recent demands for increased use of air conditioning. Ceiling or wall diffusers, high-low wall grilles, or fan pattern supply registers induce large secondary air movements and reduce stratification.

Something more is needed, however, to reduce heat loss by radiation from occupants sitting or standing next to cold exterior walls, or windows. Where the expanse of glass is large, the necessity for some protection for such areas is magnified. Venetian blinds, provided to reduce solar heat gain in summer, cannot be relied upon to protect these areas in the winter because, if raised or open, they are ineffective, and if closed, cold air will collect between the blind and the window, and flow by convection to the adjacent floor.

Radiation Combats Downdrafts

A curtain of warm air directed upward in front of the windows, either by convection or as a portion of the air conditioning system, has successfully overcome this deficiency for schools, offices and factory installations. It is our usual practice to utilize hot water finned radiation for this purpose, in covers compatible with the architectural treatment of the spaces served, in conjunction with the central air conditioning system.

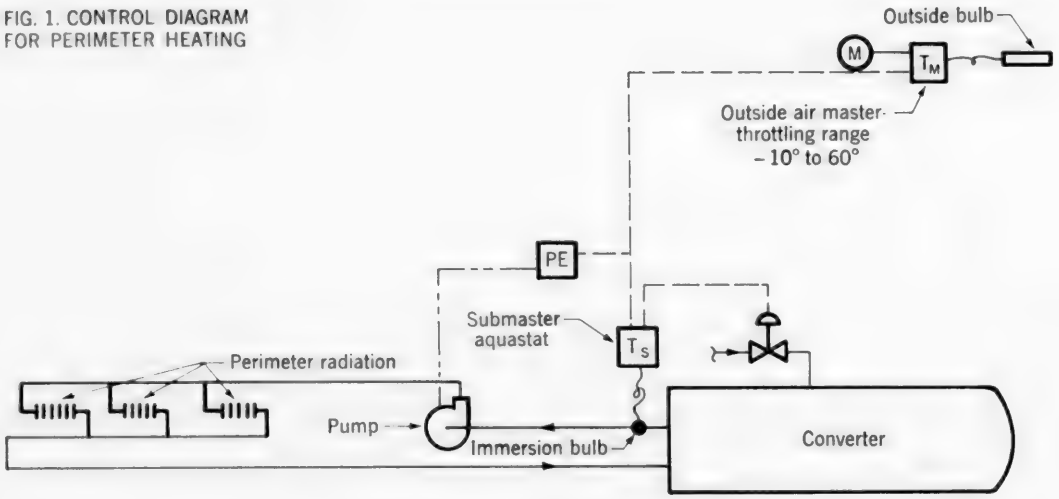
Sizing the Perimeter System

To minimize the introduction of air at lower-than-room temperatures during winter, the perimeter system is sized to deliver only about two thirds to three quarters of the heat requirement of the space it serves. When the building is unoccupied on a design day, then, air above room temperature will be required to satisfy the thermostatic controls of the ventilating system.

As lights are turned on, equipment is operated, or solar radiation effects increase the total internal heat gain within the room, it is permissible to reduce the temperature of the entering ventilation air to below the temperature at which the room is to be maintained. This reduction is made by control of the zone temperature in the ducts serving this space, if a multi-zone system is used, or by local control of mixing dampers, if a double-duct system is used.

So far, the discussion has been limited to design and control of a system to handle conditions on a winter design day, for which the outside temperature may be —10 deg F. In order to avoid overheating the room at more normal winter conditions, say 30 to 50 deg, it is necessary that the amount of heat introduced by the per-

FIG. 1. CONTROL DIAGRAM FOR PERIMETER HEATING



Converter, pump, and radiation are sized for 75% of heat loss of spaces served. Heat source for converter may be either steam or high temperature water. Outside master, T_M operates through pneumatic-electric relay, PE to start pump as outdoor temperature falls below 60 deg F. Outside master, T_M resets control point of submaster, T_S to 100 deg at 60 deg outside temperature, and to 200 deg at —10 deg outside temperature. (This assumes 190 deg average design temperature and 20-deg design drop for the perimeter system. For other design bases of the radiation, correspondingly, different reset temperatures will apply). Valves, expansion tank, make-up, etc., are not shown.

imeter system be reduced in proportion to the reduction in the heat loss from the space at these elevated temperatures. This is readily accomplished by master-submaster control of the perimeter system temperatures. Such control is ideally suited to either air or hot water systems. A control diagram for the hot water perimeter system is shown in Fig. 1.

Savings at Night

The hot water perimeter system, without modification, will maintain night temperatures of about 55 deg, based on room conditions of 75 deg, outside design temperature of —10 deg, if it is designed to handle 75% of the heat loss of the spaces it serves, thus eliminating the need to operate the ventilation system while the building is unoccupied. This feature alone is usually sufficient to provide the economic justification for the installation of the perimeter system. Further economic advantage results from reduction in heating coil capacity in the ventilating system, and in the probable reduction in the number of zones which may be required, were an all-air system to be used.

Were all other benefits of the use of the split system to be negligible, the greater comfort for personnel occupying the space would, in the writer's opinion, fully warrant the installation of such a system.

DETROIT, MICH.—Customer and employee comfort are stressed in the Manufacturers National Bank's new office. The building is fully air-conditioned and is designed to be comfortable regardless of outside temperature.

A split system is used. It supplies cool air from overhead in the summer and warm air in the winter. Finned pipe radiation under the windows and on the exterior walls provides additional heating in winter.

Most of the air is returned to a multiple zone ventilating unit, where it is mixed with fresh air which is introduced into the system at all times. This, in turn, is redistributed through the building.

The drive-in window booths are cooled and heated by using a fan and coil type cabinet heater located in each booth. Fan-coil units are also used for heating the vestibules in the main building.

Refrigeration system consists of an evaporative condenser, refrigeration compressor and water chiller that supplies chilled water to the cooling coil. The evaporative condenser is used to conserve water for air conditioning. It has a 45-ton capacity, which is adequate for estimated future expansion.

Heating system consists of a gas-fired boiler and two pumps which circulate hot water constantly to the heating coils and finned pipe radiation during the heating season. All air-conditioning equipment, heating and ventilating units, hot water boiler, and incinerator are located in the mechanical equipment room in the bank's basement.

Which is the Best

Heating and Ventilating System

For *this* School?

A systematic procedure for determining the best heating and ventilating system for a particular school of a particular design in a particular locality has been developed by a Conn. consulting firm. Designed to subdue a tendency to favor "pet" systems, it permits sound engineering judgment to quantitatively evaluate a series of design considerations. An example of its use, by the author, in selecting a system for the school shown at right is included.

Proposed Torrington High School — Nichols & Butterfield, Architects

JAMES S. MINGES, P.E.
Marchant & Minges, Engineers
West Hartford, Conn.

THIS important question which is properly asked by the school building committee invariably sets the stage for a good debate. The everlasting battle between the hydronic and warm air proponents continues to be waged at the school building committee meetings, as well as at town hearings and in the engineers' and architects' offices.

One of the reasons why so much argument can be raised about the various types of heating and ventilating systems for schools is that anyone can single out for argument two or three pet points of consideration on his favorite system, completely forgetting all the other important ones. Seldom are *all* of the factors considered and evaluated when comparing one system with another one. The fact remains that each and every system excels in some features and is lacking in others.

Because of this situation, this office has evolved a chart which attempts to present in a concise form the basic facts and major considerations of comparison for the most commonly used heating and ventilating systems for schools. When the chart on pages 62 and 63 is studied, it can easily be seen that there is no one system for a particular project that has all the advantages and no disadvantages. This becomes evident when the proper comparisons are made.

Some of us, through our actual experience with various types of heating and ventilating systems, become prejudiced along certain lines, and would place more emphasis or weight on certain factors of consideration. Therefore, each individual doing a rating job may not come up with exactly the same total rating, but, surprisingly enough, there is better correlation of results than one might expect.

We have found that the best way to use this chart is to first narrow down the field to 3 or 4 types of systems which would be applicable to the particular job. Next it should be decided which type of heat source and fuel should be chosen, such as hot water, steam boiler or direct fired furnace, gas, oil or electricity. For example, if the area is one in which there is a particularly favorable electric rate, that should be considered. In our particular area, an oil fired hot water boiler is usually considered most advantageous, although sometimes a direct fired furnace lends itself to a particular project having a compact building layout.

James S. Minges, a partner of the consulting engineering firm of Marchant and Minges, Engineers, West Hartford, Conn., graduated from Rensselaer Polytechnic Institute in 1941 with a Bachelor of Civil Engineering degree. Although licensed in Connecticut by examination in the heating and air conditioning field, his experience in engineering work has been directly connected with all of the phases of building construction work handled by his firm, which include structural, mechanical, electrical and sanitary engineering work. In the last decade his firm has provided the engineering work on over 185 schools and colleges in the New England area. He is a member of the Connecticut Society of Civil Engineers, National Society of Professional Engineers, Illuminating Engineering Society and ASHRAE, and is the author of several published articles.

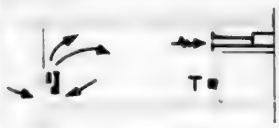
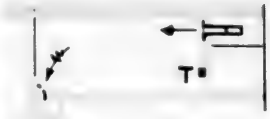
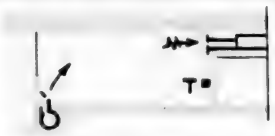
TYPE		A UNIT VENTILATOR SEPARATE EXHAUST			B CENTRAL AIR - CORRIDOR WALL HIGH AIR SUPPLY			C CENTRAL AIR - EXTERIOR WALL SILL AIR SUPPLY		
DIAGRAM										
HEATING		UNIT VENTILATOR - EACH SPACE			CENTRAL SYSTEM - COIL OR FURNACE			CENTRAL SYSTEM - COIL OR FURNACE		
HEATING LOCATION IN CLASSROOM		EXTERIOR WALL - CONTINUOUS SILL AIR SUPPLY			CORRIDOR WALL - HIGH AIR SUPPLY			EXTERIOR WALL - CONTINUOUS LOW SILL AIR SUPPLY		
VENTILATING		SEPARATE EXHAUST			CENTRAL FAN-COMBINED HEATING & VENTILATING			CENTRAL FAN-COMBINED HEATING & VENTILATING		
EXHAUST OR RETURN LOCATION IN CLASSROOM		CORRIDOR WALL - HIGH (EXHAUST)			EXTERIOR WALL- LOW (RETURN)			CORRIDOR WALL- HIGH OR LOW (RETURN)		
SYSTEM NUMBER		A-1	A-2	A-3	B-1	B-2	B-3	C-1	C-2	C-3
ITEM	HEAT SOURCE	STEAM BOILER	H.W. BOILER	ELEC.	STEAM BOILER	H.W. BOILER	D.F. FURN.	STEAM BOILER	H.W. BOILER	D.F. FURN.
1	COMFORT-(MOST) TEMPERATURE									
2	COMFORT-(MOST) AIR									
3	COMFORT-(MOST) HUMIDITY									
4	COST-(LEAST) INSTALLATION									
5	COST-(LEAST) SPACE									
6	COST-(LEAST) OPERATION									
7	COST (LEAST) MAINTENANCE									
8	ADD.-SUMMER AIR COND.(BEST)									
9	ADD.-DOMESTIC HOT WATER (BEST)									
10	ADD.-FUTURE BUILDING-(BEST)									
	TOTALS									

Fig. 1. (Above and also on facing page) Classroom heating and ventilating system rating chart developed by Marchant & Minges, Engineers.

In comparing school heating and ventilating systems, we have found that the comparisons can be channeled into just ten categories (Items 1 through 10 on the chart). Following is a list of the factors that should be considered in each of the ten categories of comparison:

1. *Comfort-Temperature*—Response to change in pupil, light and sun load; vertical temperature gradient in rooms; cold floor with slab on grade; mean radiant temperature variation with changes in temperature.

2. *Comfort-Air*—Ventilation, fresh air, air cleanliness, window drafts, window downdraft, air distribution, combat infiltration, odor control, noise.

3. *Comfort-Humidity*—Ability to maintain humidity; provide humidity with minimum amount of condensation.

4. *Cost-Installation*—Basic heating and ventilating system initial cost.

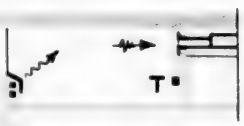
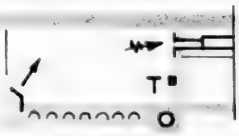
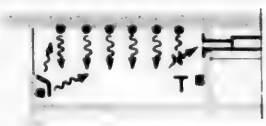
5. *Cost-Space*—Heater room vs. boiler room; mechanical equipment rooms, tunnels, chases for ducts, chases for pipes, furred spaces; loss of useable space in finished areas.

6. *Cost-Operation*—Fuel consumption, electrical consumption, overheating loss; ability to maintain comfort at lower temperature; standby losses, ease of zoning; ability to use solar gains for recirculation.

7. *Cost-Maintenance*—Filters, piping, valves, traps, vents, pumps, fans; boiler vs. direct fired furnace; cleaning building, freezing problem.

8. *Addition-Summer Air Conditioning*—Ease of adding cooling; effectiveness of cooling system addition; condensation removal.

9. *Addition-Domestic Hot Water*—Ease of adding to system; separate system required with direct fired furnace.

D CONVECTOR- SEPARATE EXHAUST			E RADIANT AIR - SPLIT			F RADIANT CEILING- SEPARATE EXHAUST			G RADIANT FLOOR- SEPARATE EXHAUST		
											
CONVECTOR- EACH SPACE			CENTRAL SYSTEM - COIL OR FURNACE			PIPING OR WIRING IN CEILING & WALL CONV.			HOT WATER PIPING IN FL. SLAB & WALL CONV.		
EXTERIOR WALL - CONTINUOUS			EXTERIOR WALL - CONTINUOUS AIR SUPPLY & FLOOR SLAB			CEILING & CONTINUOUS CONVECTORS EXTERIOR WALL			FLOOR SLAB & CON- TINUOUS CONVECTORS EXTERIOR WALL		
SEPARATE EXHAUST			CENTRAL FAN-COMBINED HEATING & VENTILATING			SEPARATE EXHAUST			SEPARATE EXHAUST		
CORRIDOR WALL HIGH (EXHAUST)			CORRIDOR WALL HIGH OR LOW (RETURN)			CORRIDOR WALL HIGH (EXHAUST)			CORRIDOR WALL HIGH (EXHAUST)		
D-1	D-2	D-3	E-1	E-2	E-3	F-1	F-2	F-3	G-1	G-2	G-3
STEAM BOILER	H.W. BOILER	ELEC.	STEAM BOILER	H.W. BOILER	D.F. FURN.	STEAM BOILER	H.W. BOILER	ELEC.	STEAM BOILER	H.W. BOILER	ELEC.

Note: All systems are based on 1000 cfm per classroom and individual room control. B, C, and E are based on 2 fan system.

10. *Addition-Future Building*—Ease of extending heating, ventilating, and domestic hot water to accommodate future building additions.

In order to illustrate, we will show our use of the chart as related to a large high school to be built in Torrington, Conn. We initially narrowed down the comparison to four systems which, in our opinion, would be the most applicable systems for the project. Since electricity is very costly relative to oil in this area, that heat source was eliminated from the comparison. Because of building layout, it was concluded that a hot water boiler heat source would be the most economical from a distribution standpoint. We also felt that the hot water boiler heat source would be more economically utilized for the various fan room locations; in this way the steam source was eliminated. Because the building is so extensive in size and spread, the direct fired systems were not considered applicable. This left for our rating the systems A-2, C-2, D-2 and E-2. Stems B, F and G were eliminated because they were considered, in this instance, inferior to the others from a comfort standpoint. Since we are rating four systems, we have allocated four checks to the one or ones which we feel are best for the particular item, three for the next best, and so forth.

Keeping in mind the considerations listed previously, our reasons for choosing the particular ratings shown on the condensed chart on page 64 are as follows:

Item 1—Comfort-Temperature. Since the classrooms are maintained at a low temperature on night set-back for fairly long periods of time, the contents of the building, including floor slab, must be brought up fairly quickly in temperature before occupancy. Therefore, it was felt that E-2, having a radiant floor, would most effectively take care of this problem. It will also not let the floor slab fall to uncomfortably low temperatures during occupancy.

TYPE		A UNIT VENTILATOR SEPARATE EXHAUST			C CENTRAL AIR - EXTERIOR WALL SILL AIR SUPPLY			D CONVECTOR - SEPARATE EXHAUST			E RADIANT AIR - FLOOR		
HEATING		UNIT VENTILATOR - EACH SPACE			CENTRAL SYSTEM - COIL OR FURNACE			CONVECTOR - EACH SPACE			CENTRAL SYSTEM - COIL OR FURNACE		
HEATING LOCATION IN CLASSROOM		EXTERIOR WALL - CONTINUOUS SILL AIR SUPPLY			EXTERIOR WALL - CONTINUOUS LOW SILL AIR SUPPLY			EXTERIOR WALL - CONTINUOUS			EXTERIOR WALL - CONTINUOUS AIR SUPPLY & FLOOR SLAB		
VENTILATING		SEPARATE EXHAUST			CENTRAL FAN-COMBINED HEATING & VENTILATING			SEPARATE EXHAUST			CENTRAL FAN-COMBINED HEATING & VENTILATING		
EXHAUST OR RETURN LOCATION IN CLASSROOM		CORRIDOR WALL - HIGH (EXHAUST)			CORRIDOR WALL - HIGH OR LOW (RETURN)			CORRIDOR WALL HIGH (EXHAUST)			CORRIDOR WALL HIGH OR LOW (RETURN)		
SYSTEM NUMBER		A-1	A-2	A-3	C-1	C-2	C-3	D-1	D-2	D-3	E-1	E-2	E-3
ITEM	HEAT SOURCE	STEAM BOILER	H W BOILER	ELEC	STEAM BOILER	H W BOILER	D F FURN	STEAM BOILER	H W BOILER	ELEC	STEAM BOILER	H.W. BOILER	D.F FURN.
1	COMFORT-(MOST) TEMPERATURE		✓✓✓			✓✓✓			✓✓			✓✓✓✓	
2	COMFORT-(MOST) AIR		✓✓✓✓			✓✓✓✓			✓✓			✓✓✓✓	
3	COMFORT-(MOST) HUMIDITY					✓✓✓✓						✓✓✓✓	
4	COST-(LEAST) INSTALLATION		✓✓✓			✓✓			✓✓✓✓			✓	
5	COST-(LEAST) SPACE		✓✓✓✓			✓✓			✓✓✓✓			✓✓	
6	COST-(LEAST) OPERATION		✓✓✓✓			✓✓✓			✓✓✓			✓✓✓	
7	COST (LEAST) MAINTENANCE		✓			✓✓✓✓			✓✓			✓✓✓✓	
8	ADD.-SUMMER AIR COND.(BEST)		✓✓			✓✓✓✓						✓✓✓✓	
9	ADD.-DOMESTIC HOT WATER (BEST)		✓✓✓✓			✓✓✓✓			✓✓✓✓			✓✓✓✓	
10	ADD.-FUTURE BUILDING-(BEST)		✓✓✓✓			✓✓✓			✓✓✓✓			✓✓✓	
	TOTALS		29			33			25			33	

Fig. 2. Condensed rating chart applies to the proposed Torrington High School.
Note: (E) Radiant Air—Floor, here, is same as Radiant Air—Split, Fig. 1.

Item 2—Comfort-Air. The central air systems, C-2 and E-2, were believed to most efficiently and practically provide air filtering and air cleanliness. Electrostatic filters which can eliminate dust, dirt and pollen from the occupied spaces are only feasible with a central air system.

Item 3—Comfort-Humidity. The central air systems in C-2 and E-2 are the only systems which can practically provide humidification to the classrooms. In our estimation, this is a very important factor as it relates to health and comfort.

Item 4—Cost-Installation. In our area, the convector with separate exhaust system, D-2, would be the most economical system of the four, insofar as first cost is concerned.

Item 5—Cost-Space. A-2 and D-2 excel in that the least amount of space is taken out of the building to accommodate these systems. A central air system requires larger furred areas to accommodate duct work.

Item 6—Cost-Operation. The unit ventilator system, A-2, has the lowest overall operation cost since its horsepower requirements are less than the others. The convector with separate exhaust system, D-2, is relatively expensive because of the fuel cost related to taking 100% outside fresh air in cold weather.

Item 7—Cost-Maintenance. The central systems, C-2 and E-2, are less expensive, compared to A-2 and D-2, because of the higher cost of maintenance of the piping, vents, valves, etc., with the latter. System A-2 has the added disadvantage of having filter and fan maintenance requirements in every room.

Item 8—Addition-Summer Air Conditioning. Only the central air systems, C-2 and E-2, can best accommodate the addition of equipment for future cooling.

Item 9—Addition-Domestic Hot Water. Since all of the systems utilize a hot water boiler as a heat source, they are all equally effective in providing for this necessity. A direct fired system would be at a rating disadvantage if it were in the picture here.

Item 10—Addition-Future Building. Systems A-2 and D-2 can best handle future building additions since it is necessary only to extend the hot water piping, while with the other systems it is also necessary to extend the supply ductwork.

On the basis of our judgment, systems C-2 and E-2 scored the highest rating and happened to be equal in this particular case. We have recommended system E-2 over C-2 *for this particular school* because we feel that it will provide the most comfort in bringing the school up to temperature after long shut-down periods, as described in Item 1. Other than this, C-2 is comparable in most respects to E-2.

We have found that the rating chart has not only provided us with a basis for listing all of the comparisons; it is also a record of the reasoning why a particular system was chosen. This becomes particularly important when someone challenges the reasons why a certain system was selected, perhaps at a time long after the system has been designed. By merely referring to the checks in the chart, we can quickly determine the basis on which the system was chosen.

The Engineer Looks at Direct Fired Radiant Heating

In recent years a new application of a timeless heating principle has been offered to designers of industrial buildings. Radiant units, strategically placed overhead, expose to their surroundings ceramic elements heated to a bright red glow by the direct combustion of gas on the element surface. These units radiate heat directly onto workmen, floors, tools, and materials. No direct attempt is made to heat the air of the building. Following is a weighing of pros and cons deduced from a study of several installations including foundries and garages.

H. I. MILLER, Jr.
Industrial Hygiene Engineer, Lackawanna Plant
Bethlehem Steel Company

THE claims made by proponents of direct-fired radiant heating have been especially interesting because they appear to hold answers to some vexing problems in the area of uniform heat distribution. Spot heating by means of salamanders and unit heaters has been used in many instances where the heating of the whole working space seemed impractical. Often unsatisfactory as too hot or too cold, sometimes both at once, they leave much to be desired particularly in the absence of fixed work stations. Portable salamanders and oil-fired heaters have been used, none of which are consistently satisfactory, and any of which can be unsafe. Central warming stations are obviously inefficient in proportion to the time spent off the job in order to be near them. The trend for some time has been toward environmental comfort rather than mere tolerance, with efforts toward maintaining the entire working area at some nominal temperature, say 55 or 60 deg F.

Perhaps one "break-through" in the treatment of sizeable industrial structures has been the use of multiple tempered air supply systems. Now the projection of heat at surface radiating temperatures of 1600 deg F offers another approach. Its potential advantages and disadvantages are best introduced by first citing some of the problems of other methods of area heating.

Air Heating Methods

Acceptable distribution of heat by warmed air in large industrial buildings, particularly where capacity must take into account makeup air to replace variable amounts of exhaust ventilation, is likely to be complex and costly. Even multiple ducting and outlets may not solve problems of excessive infiltration or of adequate mixing with incoming cold air. An alternative to ducting, toward which many establishments incline, is the use of several space heaters ranged along the walls so that air is taken from floor level and from outdoors as needed and is thrown appreciable distances to blanket walls and floors. There is no question that with tight and at least moderately insulated buildings such means of heating have been found entirely satisfactory. Nevertheless, there are instances of complaint of excessive air motion, cold floors, excessively warm or cold areas, and even disputes among workmen concerning the proper setting of the large capacity outlets of such units.

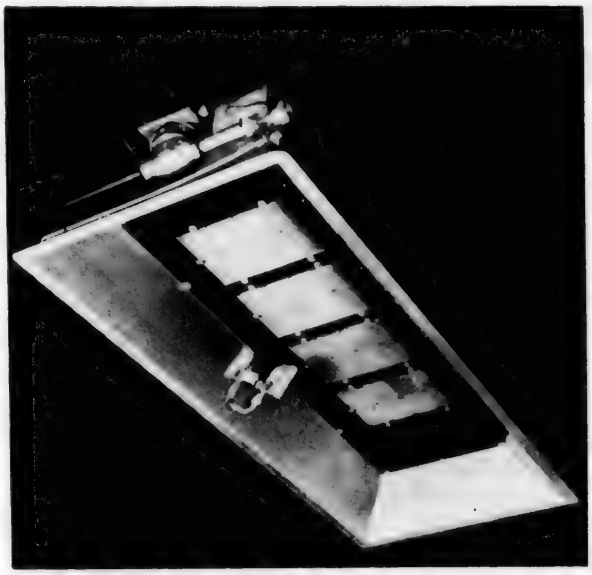


Fig. 1. Perfection direct fired gas unit with ceramic panels through which gas passes to burn on surface heating it to 1600 deg F.

Problems of steam availability, fluctuating loads, extensive piping, trapping and condensate handling have directed attention, in the steel industry at least, away from steam heating toward direct fire devices. These by reason of fast response and flexibility, have been widely accepted for space heating, both with and without ducting. Some of them mix the products of combustion with the heated air for greater efficiency, a practice that is questioned among hygienists. Those that utilize a heat exchanger, venting flue gases to outdoors, loses 20% or more of the heat input under best conditions.

Herbert I. Miller, Jr., is the industrial hygiene engineer at the Lackawanna Plant of Bethlehem Steel Co. Graduated with a B.S. in Chemical Engineering from Washington University, he earned an M.S. in Sanitary Engineering (Industrial Hygiene) from Harvard University. For sixteen years he has been actively engaged in industrial health engineering work, including dust, fume, and mist control, gas handling, heating and ventilating, noise control, air conditioning, and radiation protection.

He inspected industrial plants throughout Missouri for the State Board of Health, and then joined St. Joseph Lead Co. working for several years on the problems associated with mining, milling, and smelting lead and zinc. These included design of dust collection systems, the largest of which had a capacity of 100 tons of collected dust per 24-hr day.

During World War II he was a U.S. Army Sanitary Corps officer assigned to various industrial establishments of the Ordnance Dept. and the Air Force on problems of industrial health. In 1951 he joined Catalytic Construction Co. in Philadelphia as a project engineer in his field in the design of AEC establishments, and shortly thereafter moved into administrative and management phases of design projects for AEC and chemical plants.

He is a member of the American Industrial Hygiene Association and its Engineering Committee, and has been president of its Western New York Section. He is a member of the Association of Iron and Steel Engineers.

Warm water floor panels are ruled out by heavy impact loads, and, further, would require acres of piping for large mill buildings. They are troubled also by sluggish response to demand. Both steam and water radiators are subject to freezing in the path of air entering through rolling doors, and recovery after doors are closed may be slow.

How does direct-fired gas radiant heating overcome some of these problems and what new problems does it introduce? A limited study of seven installations was made to determine this information, and out of it were drawn the general conclusions set forth here.

It is apparent that red hot surfaces arranged overhead in a pattern can be made to place heat in all desired locations, so that even in drafts there should be a sensation of warmth, although not necessarily enough to offset the chilling effect of cold air in motion.

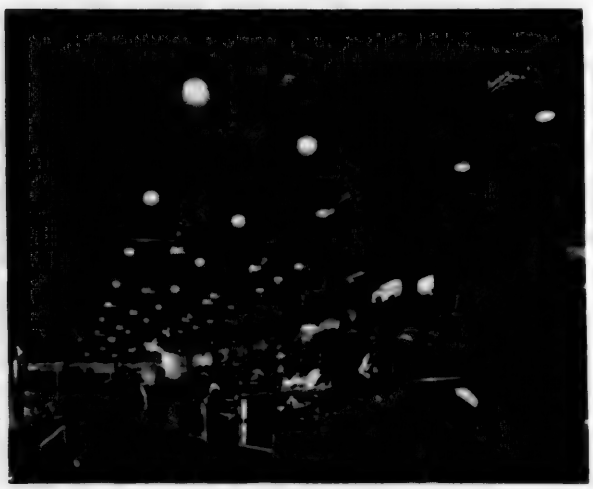


Fig. 2. Grandstand of Genesee Monroe Racing Association, New York, where gas fired radiant heaters take chill off open air. Pilots quickly relight units blown out by wind.

A typical heating unit is shown in Fig. 1. Gas introduced with air into a mixing plenum passes through ceramic panels on the underside of the plenum and the mixture burns on the lower surface of the ceramic. This surface reaches a temperature of 1600 to 1650 deg. Around the burner assembly is a bright aluminum reflector which may be straight sided or parabolic, and has the purpose of better defining the area receiving radiation. Using natural gas, this type of unit is rated at about 25,000 Btu per hr. per square foot of heated ceramic surface, and the unit shown in Fig. 1 has about 2 sq. ft. of such surface. The units may be used singly or in multiple assembly. They are stated to be applicable to natural gas, manufactured gas, mixed gas, or propane. The use must be specified and the output in Btu will vary with the fuel used. About 60% of the heat is claimed to be radiated downward, the remainder being transferred by convection and undirected low level radiation from warmed sides of the unit.

Figs. 2, 3, and 4 show a variety of successful applications of this type of heating. Fig. 2 shows a racetrack grandstand in a northern state, which is closed on three sides and open toward the track. Due to gusty winds that extinguish the flames (which are automatically relighted) heat is not available for about five percent of the time heat is required, but otherwise the system is satisfactory. In Fig. 3 and 4 are seen, respectively, a garage and a foundry.

Questions naturally arise as to the tolerance of heat from such high temperature elements, the economy if only 60% of the heat input is available for projection, and the disposal of flue gases with their high moisture content. A forest of stacks sticking through the roof or a complex exhaust duct system might be visualized. These and other considerations are discussed in the following paragraphs.

Distribution of Heat

The observed effect in successful installations is one of pleasant universal warmth of floors, materials, tools, and surrounding air. The heat from overhead is a

TABLE I—A PILOT PLANT INSTALLATION

Floor Area	8,000 sq ft
Eave height	29 ft
Roof construction	Metal with 1 inch insulation
Wall construction	8 inches masonry to 14 ft; remainder fiberglass plastic
Height of heaters	30 ft above floor
Heat input	144 Btu per (hr) (sq ft floor area)
Heat received, measured at floor	170 to 95 Btu per (hr) (sq ft)
Temperature measured central location:	
Air 16 ft above floor	70 deg F
Air 12 ft above floor	70
Air 8 ft above floor	71
Air 4½ ft above floor	71
Material 4 ft above floor	73
Air at floor	73
Floor surface	77
Temperature measure near outside wall:	
Air 4½ ft above floor	67
Air at floor	69
Temperature, outdoor air	37 to 42

fraction of that from sunlight and, except when heaters are placed too low, is not only tolerable but pleasing. The effect on the floor is to make it a large-area warm panel. The air then becomes heated by convection from the floor and other objects which have received direct radiation. Radiant energy passes through air with negligible heating effect on the air. It is absorbed (or reflected to some degree) by solid materials on which it impinges. The net result, however, is a remarkable uniformity of air temperature at various levels, as is shown in Table 1 for an installation where measurements were made.

The amount of infiltration or makeup air at floor level that can be properly heated by these elevated radiant heaters is a matter for study. At present, infiltration is estimated and additional heater units are directed toward doorways or other points of heavy load. A useful property of the system is the immediate sensation of warmth from the direction of the heaters after a door, particularly a large rolling door, is closed. Also the floor has a heat capacity that may maintain some warmth during the time the door is open. Baffles serve to diffuse air at designed inlets and may be placed before mandoors to cause mixing of entering air with room air before traveling very far. Reduction of infiltration is always a saving step but care must be taken to assure necessary ventilation.

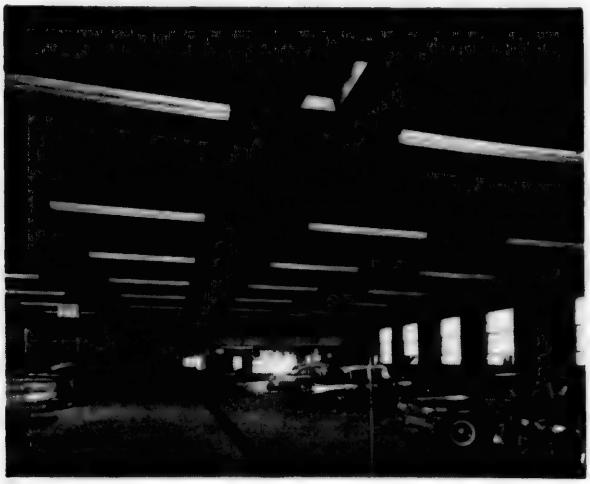


Fig. 3. Radiant units about 18 ft above floor serve garage of Suor-Keller Chevrolet, Inc., where frequently opening doors and cold floors make conventional air warming systems unsatisfactory.

Flue Gases

To get the greatest benefit from the investment, the heat of combustion must be utilized to the fullest degree. Although heater could be vented individually to outdoors, it would not only be costly to do so, but most of the 40% of heat input not radiated would be lost. Accordingly the combustion products normally escape into the building air at some distance below the roof and away from (i.e., not directly under) roof vents or exhausters. Although questionable hygienically, this feature is in widespread use, apparently quite safely since these gases are emitted well above the working area and do not mix with breathing air. Most such installations are acceptable by AGA standards. Cranemen or other workmen should never be employed regularly above such heaters.

Fig. 4. High ceilings and need for crane clearances make radiant units a reasonable choice at Columbia Foundry.

Condensation

Since the products of combustion of natural gas include about two pounds of water per pound of gas burned, removal of flue gases from the building is tied very closely to the prevention of condensation. Ventilation, whether gravity or powered, is an absolute essential.

The amount of opening for gravity ventilation is empirical, being suggested by one manufacturer as 50 square inches outlet area high in the building for each 100,000 Btu per hr, heat input. A comparable air inlet area must be provided. Many buildings have ample inlet area by nature of their construction or state of maintenance, and many have no lack of outlet area. An excess of outlet area can be disastrous. Gravity ventilators, undampered power ventilators, or open roof monitors may, in cold weather, permit excessive air changes in the building to the extent that the heaters are inadequate. Regulation of air changes, as by dampering, must be provided. Where powered exhausters with self-closing dampers are employed some provision must be made for gravity ventilation when the powered exhausters are shut down. Auxiliary small gravity roof ventilators, always open, are one means; another is the placing of stops to prevent the self-closing dampers from closing completely.

Calculations for one steel warehouse, where serious condensation was experienced from the very heaters bought to prevent condensation on stainless and aluminum sheet, showed the necessity for ventilation and insulation of the underside of the roof. Since a one-inch thickness of insulation has been applied the amount of ventilation has been found adequate and the condensation problem is solved. Wherever winters are severe, roof insulation is important, and calculations will show that the savings in initial heater installation and in fuel will offset the extra cost of such insulation in two or three years where heating season degree-days total as much as 4,000. Needless to say, insulation on the underside of a roof should have a vapor barrier on its underside. Sidewall insulation is an optional economic feature, as condensation here has not been reported as important.

Limitations of Use

The presence of flammable solvents or dusts rule out these heaters, as does any condition where an open flame device would be unsafe. A minimum of nine feet distance is recommended for small lots of combustibles. Local codes may require garages to cover all openings with stainless steel wire screen to isolate the flame. Units so treated should be checked for carbon monoxide in the combustion products. Where drafts are a problem some success has been attained with nichrome wire grids over the burners as windshields, in which case the same precautions should be observed. The use of manufactured or propane gas should be surrounded by all available safeguards, including introduction of an odorant if not already supplied. Propane systems need special consideration because of the great density of the vapor that might escape and collect in low and remote locations and be accidently ignited.

Observations have been limited to one-floor buildings, the floor being concrete slab on ground. Applicability of the system to upper floors or to buildings with floors over crawl spaces or basements is unknown to date.

Height and Placement of Heaters

The general practice has been to arrange heaters in checkerboard fashion and at heights dictated by ceiling, mounting trusses, cranes, and other equipment. Heights of 12 to 40 ft about floors have been satisfactory. Although in one installation sedentary personnel complained that the 12-ft height placed too much heat on the head, ambulatory workers did not complain of this height. There is no particular advantage in locating the heaters high. Indeed, in doing so a greater heat input is required because of distance and the greater wall area in the heated zone. For any given mounting height the number and placement of the units is established from manufacturers' data for the type of unit and the calculated heating load. Tilting of units permits grouping of units in pairs of four, tilted outward, for convenience in servicing; but the maximum permissible angle of tilt must be obtained from the manufacturer. Units can be placed along walls below crane level and tilted to throw heat from foot of wall toward building interior.

Recent trend is away from the checkerboard arrangement in favor of more concentration of heaters around the periphery of buildings to take better care of cold walls and infiltration.

Instrumentation and Controls

Demand is met similarly to other gas fired appliances by room air thermostat actuating a simple solenoid valve. Control circuit is maintained by action of a continuously burning pilot on a sensing element so that pilot failure automatically shuts off gas valve. Equipment is available for automatic shutoff of both pilot and main valve where codes so require. Electric reignition by push button can be furnished. For continuously open pilot units automatic electric reignition can be furnished.

A single room-air thermostat (shielded from direct radiation) may control one or a group of heaters. Perimeter zoning with thermostat for each zone permits satisfying local demands for heat by means of a relatively few units.

Units above cranes can damage electrical and mechanical components if exposed too closely and too long. Shielding of such components with bright aluminum sheet, with or without insulation, has been successful. Other means are various tripper devices to shut the heaters down when the crane passes, or manual switches at the floor can be used for that purpose. The crane cab should not travel directly under heaters. It should, however, be at a lower level than the heaters and may need a sunshade to keep out glare and excessive heat.

Maintenance

Users report that ruggedly designed, properly used units need about the same attention as fluorescent lighting. Dirty fuel may clog orifices and severe dust and fumes can clog perforations in the ceramic plate, necessitating blowing out with compressed air. Lubrication is unnecessary, the only moving parts in the heater being the sealed-in components of the solenoid gas valve. Unless electric ignition is furnished, the pilots are lighted once a season, and shutdown in spring is accomplished by turning off the main supply valving. The reflectors need cleaning as often as necessary to retain a bright surface.

Performance Guarantee

New equipment such as this is sometimes oversold. In view of occasional misapplication and the dependence on manufacturers' empirical data for placement, ventilation, etc., it is important for the buyer to secure a guarantee of materials, workmanship, and performance that binds the supplier to meet the design conditions stated. One installation investigated was underdesigned by some 30% of needed capacity, which was later added at the supplier's expense to meet the guarantee.

Costs

In a typical mill building an estimate indicated the cost of this type of heating to be comparable to that for conventional direct-fired blower type space heating with little or no ductwork. Studies by one manufacturer present evidence that fuel consumption over the heating season is lower for this type of heating than for some other direct-fired systems if the products of combustion are allowed to mix with air under the roof before being vented from the building; while, on the other hand, venting directly from heater to outdoors may require 10% or greater excess over that required by other systems.

Summary

It is apparent that certain advantages are associated with direct-fired radiant heating, the more important ones of which are pleasing sensation of general warmth, warm floors and materials, freedom from fan-induced drafts, flexibility in operation, rapid response to demand, minimum power requirements, minimum maintenance, and possible fuel savings. The limitations of these heaters are primarily concerned with employment of open-flame devices and gas-fired equipment, the problems of which are widely understood in industry. Certain empirical data must be supplied by the manufacturer and the reliance on him for recommendations is such that he should guarantee the performance of his units. Ventilation and roof insulation must be provided and the heating load must include adequate allowance for the ventilation.

Refrigerant Piping Hookups for Parallel Compressors

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In addition to a discussion of some of the engineering principles that govern this application, this article presents examples of what is considered improper and preferred refrigerant piping hookups.

THE art of paralleling two or more refrigerant condensers on a common air conditioning or refrigeration system, basically involves a simple, but frequently misunderstood principle. Refrigerant flow, whether gas or liquid, through two or more parallel circuits will be proportioned through each circuit inversely with the square root of the resistance or pressure drop through it. In other words, the pressure differential across all parallel circuits must be equal, resulting in greater flow rates through circuits with the least resistance. The same principle applies to electrical circuits, wherein electrical current is the flow medium and the potential difference or voltage is the counterpart of pressure differential across the circuits.

Example of Poor Design

Figure 1 illustrates an improper arrangement of parallel condensers, and the result of the poor design. Two air cooled or evaporative condensers are illustrated, one operating and the other idle, a condition encountered throughout much of the cooling season due to oversized equipment for any period when design conditions do not exist. Discharge gas from the compressor at a pressure of 125 psig equalizes through the idle condenser to the receiver. Essentially no flow occurs through this line, so there is no loss in pressure. Refrigerant flow to the operating condenser, however, does result in pressure loss through (1) the gas valve which may be located at the condenser inlet; (2) through the coil, and (3) through the liquid service valve that may be located at the condenser coil. A total pressure drop of three pounds through the various restrictions is indicated. However, since the pressure at the inlet to the operating coil is equal to the pressure at its outlet, a three pound pressure drop, resulting from the necessary flow rate, is not possible unless the pressure is boosted within the coil.

In a refrigerant condenser, this pressure booster is automatically provided in the sense that a static head of liquid will form to offset the pressure difference required for drainage. A 22.7-inch high vertical column of Refrigerant-12 liquid at a temperature of 117 deg F exerts one pound of static pressure. Since Refrigerant-22 liquid is slightly less dense, a column of 25.2 inches high is necessary at the same temperature to provide a pound of static pressure. The static head indicated in Figs. 1 and 2 is: h = (126 psig − 123 psig) 22.7 inches per psi = 68 inches (Refrigerant-12).

Refrigerant Flow in Condenser

As refrigerant flows into the operating condenser, it will condense from a gas to a liquid, but the liquid cannot drain from the outlet until the pressure at the outlet becomes slightly greater than the pressure in the drain line. The result is that liquid refrigerant will hold-up in the condenser coil to the extent that the static head will offset the pressure differential. This is highly objectionable since less surface in the condenser is available for rejecting heat, causing high discharge pressure from the compressors and consequently, higher electrical consumption by the compressor motors. On the other hand, if a head pressure controller brings on additional condensers to prevent high condensing temperatures, a vicious on-off cycle may be encountered with the fans on the other condensers. The continuous cycle may burn out fan motors, or at least shorten motor life, and will result in high operating costs. Where unequal size condensers are used, an improper hookup may not permit complete drainage from the largest condenser even at the full load condition. The results can be compressor motor overload, due to the high condensing temperatures required, inability of the system to stay on the line on

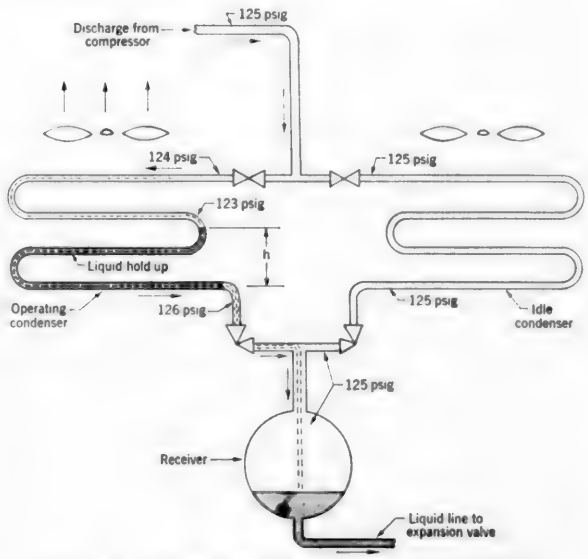


Fig. 1. Liquid hold-up in parallel condensers.

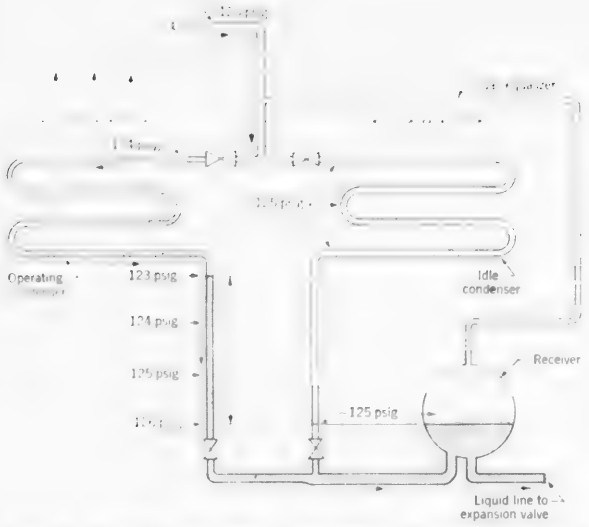


Fig. 2. Parallel condensers arranged to prevent liquid hold-up.

hot humid days when mechanical cooling is desired most, shorter life of the equipment and greatly increased system operating costs.

Liquid hold-up in a condenser is also objectionable since it increases the refrigerant charge required in the system. Air cooled and evaporative condensers have considerable internal volume with relationship to the evaporator and a system with a condenser which cannot drain freely, will require an appreciable increase in system refrigerant charge.

Preferred Hookup

Figure 2 illustrates the preferred hookup for parallel condensers, either of which can be shut down with the other operating. Note that drop leg has been provided at the outlet of each condenser and a liquid trap formed at the bottom of each leg. The height of the leg is determined by the maximum pressure drop expected through its respective condenser coil circuit, including any restrictions between points of equalization on the discharge line and the high pressure receiver. The gas equalizer between the receiver and the discharge line is necessary to maintain a stable pressure in the receiver. Without it, the pressure in the receiver would vary and good drainage from the condenser could not be assured.

The pressure drop through the operating condenser in Fig. 2 is shown to be a total of 2 psi—one pound through the gas inlet valve, a pound through the condenser coil, and a pound through the service valve at the liquid outlet. The pressure losses indicated are merely for illustrative purposes and in general, the pressure loss through the valve at the liquid outlet will be less and the pressure loss through the condensing coil will be greater.

Since the total pressure loss is 3 psi, a Refrigerant-12 system would require three times 22.7 inches or a total static head of 68 inches to offset the pressure drop. The static head is measured between the highest expected refrigerant operating level in the receiver and the bottom of the condensing coil.

The pressure in the operating drain leg is shown to be one pound higher than the same elevation in the receiver. The higher pressure is necessary here to offset the pressure loss through the service valve below this point. Note that since a liquid trap is formed below each drop leg, the liquid seal is not broken at the idle condenser. Without the trap, the 125 psig pressure could equalize back to the operating condenser outlet at the higher elevation, making the drop legs ineffective.

Use of Different Size Units

Figure 3 illustrates a refrigerant piping arrangement that can be used with unequal size air cooled or evaporative condensers. The two smaller size condensers handle less refrigerant and the equivalent length of each circuit of the coil is likely to be less than for the larger. Consequently, the pressure drop will be small and it is only necessary to trap the drain lines an elevation difference sufficient to offset the pressure drop through each respective condenser circuit, including the service valve. After

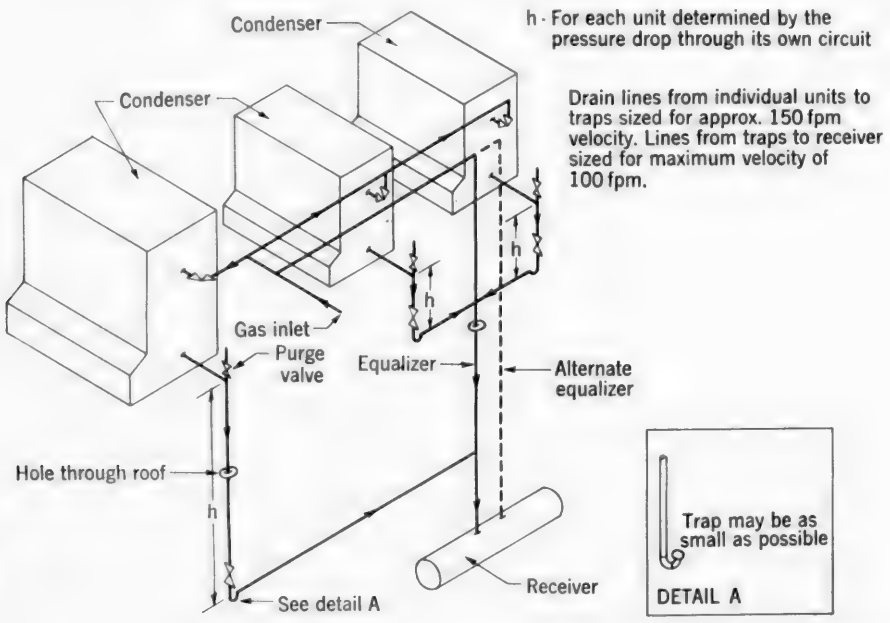

Condenser
h - For each unit determined by the pressure drop through its own circuit
Condenser
Drain lines from individual units to traps sized for approx. 150 fpm velocity. Lines from traps to receiver sized for maximum velocity of 100 fpm.
h
h
Gas inlet
Purge valve
Equalizer
Alternate equalizer
Hole through roof
h
See detail A
Receiver
Trap may be as small as possible
DETAIL A

Fig. 3. Parallel arrangement of different size air cooled or evaporative condensers.

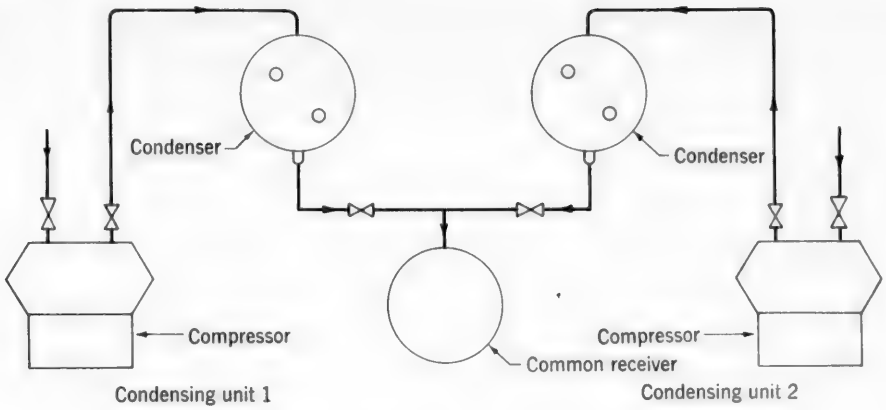


Fig. 4. Improper hookup of parallel condensing units and a common receiver.

providing the necessary drain leg height, the two lines may be joined together to drain through a common line to the refrigerant receiver. This permits the use of a single penetration through the roof for the two units.

The larger condenser may have substantially more pressure drop through it, and the height of the drain leg must be increased proportionately. After providing the necessary elevation difference, this line may also drain into the common return line to the receiver. Note, however, that a small liquid trap is provided at the bottom of each drain leg to effect a liquid seal. This trap may be as small as pipe or tube fittings will permit as long as the loop is below the horizontal drain header.

The receiver should be equalized to the common gas inlet to all condensers. The equalizer may be run directly from the receiver, or from the vertical liquid drain line to the gas inlet. The common liquid drain line should be generously sized to provide sewer type drainage with a velocity not greater than 100 fpm.

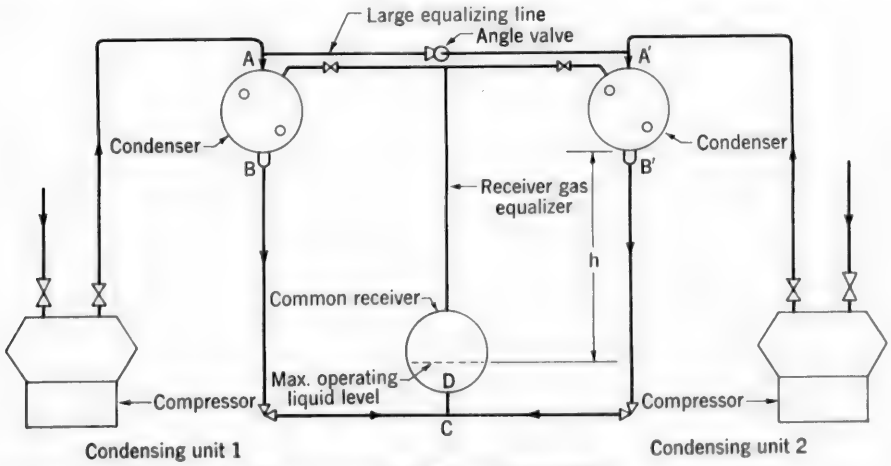
Improper Arrangement

Frequently, multiple condensing units, containing a compressor and condenser, are located on a system with all other components common. Whenever the low side of the system is common to two or more condensing units, a single high pressure refrigerant receiver should be used. Figure 4 illustrates an improper arrangement of parallel condensing units with a common high pressure receiver. Regardless of how the condenser load is controlled on each of the two condensers, unequal pressures will occur in the condensers. The pressure difference between condensers may be large or it may be small, but it is almost impossible to operate throughout a season without reaching a condition where one condenser pressure will be at least a pound higher than the other.

To offset the pressure difference, refrigerant liquid in the condenser at the lower pressure cannot drain until a sufficient quantity has collected to block off tube surface. This causes pressure buildup due to reduced heat transfer surface available. Furthermore, should one compressor shut down for reduced load operation while water continues to flow through its condenser, refrigerant vapor from the operating portion of the system will continue to condense in the idle condenser, filling it with liquid which cannot drain to the higher pressure in the receiver. For prolonged operation, most of the liquid charge could lay dormant in an idle condenser while the liquid seal at the receiver may be broken. The compressor discharge gas could then bypass through the expansion valve back to the compressor suction causing overheating.

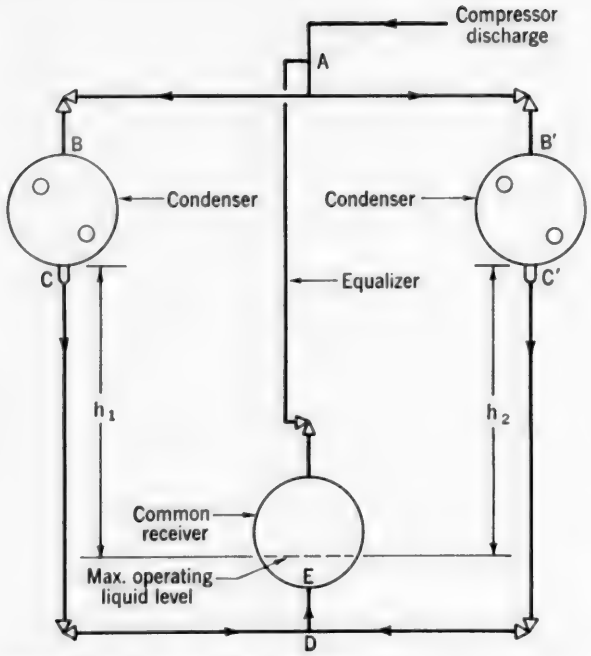
Good Arrangement of Condensers

The preferred arrangement of parallel condensing units is illustrated in Fig. 5. Note that the drain leg from



h = Static head necessary to offset pressure drop through circuit ABCD or AA'B'CD, whichever is greater at extreme condition.

Fig. 5. Proper arrangement of parallel condensing units and a common receiver.



h_1=Static head necessary to offset pressure drop through circuit ABCDE
h_2=Static head necessary to offset pressure drop through circuit AB'C'DE

Fig. 6. Parallel shell and tube condensers with common discharge line and receiver.

each condenser has been trapped to provide a liquid seal before entrance is made to the receiver. Also, a large equalizing line has been connected between the two compressor discharge lines to permit equal loading on the two condensers, regardless of the operating capacity of either compressor. A gas equalizer is connected from the receiver to each condenser, with a service valve in the branch lines to permit isolation of either of the two condensing units for service work while the other unit is operating.

The elevation of the bottom of the condensers above the maximum operating liquid level in the receiver should provide sufficient static head to offset the pressure drop from each compressor discharge line to the receiver at the most extreme condition. The pressure drop should be checked through the circuits indicated for the full load duty, as well as when one compressor is idle and the other is operating at 100% capacity. For the latter condition, it will be seen that the gas equalizing line between the two condensers should be generous in size to minimize pressure loss through this circuit when both condensers are handling approximately 50% of the capacity of a single operating compressor. A rule of thumb is that the equalizing line be sized one pipe or tube size smaller than the discharge line from each compressor. An angle type valve is preferred over a globe type to minimize pressure loss through the equalizer.

One Compressor for Two Condensers

A satisfactory arrangement of shell and tube condensers with a common compressor discharge line is shown in Fig. 6. Discharge gas from the compressor(s) should branch through similar circuits to each condenser. The gas equalizer from the receiver should be connected to the common compressor discharge line as shown, or where insufficient elevation is available between the condensers and receiver, individual gas equalizers may be connected to each condenser. The latter permits a reduction in the elevation difference since the equalizer is connected downstream from the gas service valve at each condenser inlet. When equalizing directly to the condensers, it is prudent to include an equalizer to all condensers, each containing a hand valve to permit servicing one condenser circuit while another is in operation.

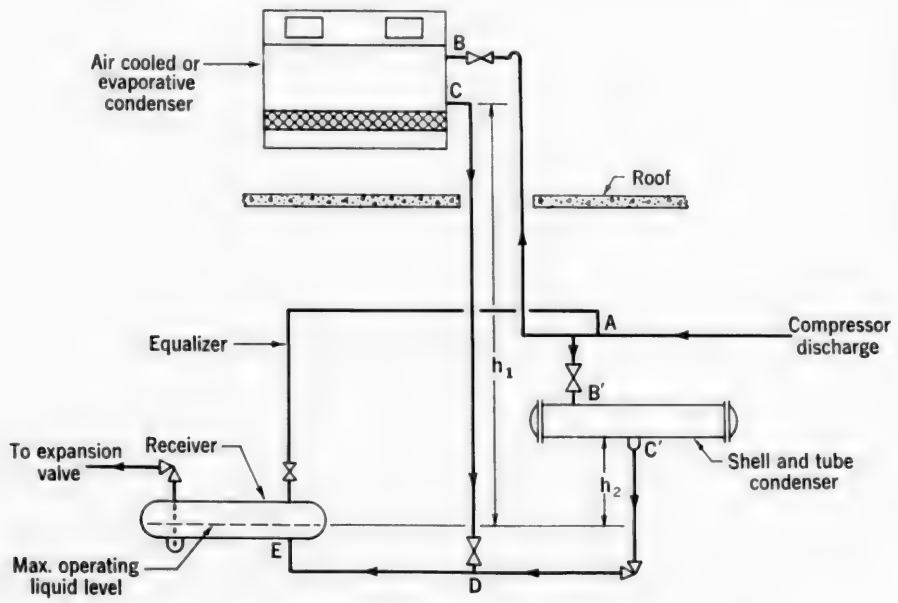


Fig. 7. Parallel arrangement of different type condensers.

h_1= Static head necessary to offset pressure drop through circuit ABCDE
h_2= Static head necessary to offset pressure drop through circuit AB'C'DE

Pressure Loss

In calculating the pressure drop through refrigerant circuits, it will be found that angle valves generally have a pressure drop equal to between 30 and 50% of the pressure loss through a globe valve. Therefore, where pressure losses are sizeable and penalize the installation by excessive elevation requirements, angle type valves are greatly preferred. Unlike the air cooled and evaporative condensers, the shell and tube condenser has a very small pressure loss through it. There is a loss at the entrance to the condenser equal to one velocity head ($V^2/2g$). This may be as high as a pound loss for larger line sizes where relative high velocities are used. For smaller discharge lines, the loss will be substantially less.

The pressure loss through the tube bundle of the shell and tube condenser is infinitesimally small and may be ignored. The other pressure loss it at the condenser outlet and will be about a half velocity head, but based upon liquid flow, this loss is very small. For a pressure drop computation, this also may be ignored since the vortex action at the outlet connection will require a greater static head of liquid to overcome it than will be the calculated pressure drop. The static head of buildup at the outlet, in the neighborhood of one-half inch, will not reflect in any pressure differential beyond the condenser.

Observe that an oversized liquid outlet connection is provided on the better designed shell and tube condensers (*C* and *C'* in Fig. 6). This is necessary where the condenser will drain to a receiver to maintain a low velocity for overcoming the vortex action. This larger connection may be reduced to a smaller one at a distance from 4 to 8 inches below the bottom of the condenser. If the reduction is not made in the vertical plane, a greater distance may be required.

Two Types of Condensers

In a few cases, an air cooled or evaporative condenser, generally the latter, may be located in parallel with an existing shell and tube tye condenser. This may be necessary due to an increase in building cooling requirements, but the restrictions on water supply may make the addition of a shell and tube condenser impractical. Figure 7 illustrates the proper arrangement.

Each condenser should be elevated a sufficient amount above the maximum operating level in the receiver to offset the pressure drop from the point of equalization in the discharge line, through its respective circuit to the receiver. The elevation of the unit above the receiver can be greater than the calculated static head, but should never be less than this amount.

Pressure loss through air cooled and evaporative condensers is not as easily determined as with the shell and tube type. Some equipment manufacturers make this information available in their equipment literature. Where it is not, unless the purchasing engineer is extremely adept at making his own calculations, this information should be demanded from the equipment manufacturer. Using data published by one manufacturer on another's condenser may be extremely dangerous, since depending upon the refrigerant, coil loading, individual circuit length, and tube diameter, this pressure loss value may be as high as ten times that of another.

Conductive Flooring for Hospital Operating Rooms

An exhaustive study on the subject of conductive flooring to be used in hospital operating rooms was reported in the Journal of Research of the National Bureau of Standards. This study was done under a project that was sponsored by the Office of the Chief of Yards and Docks, Department of the Navy, and Engineering Division, Director of Civil Engineering, Department of the Air Force. The staff of the Division of Building Research of the National Research Council of Canada, cooperated in this study.

The study showed that the durability and appearance of lineoleum and rubber may depend on periodic waxing. Conductive waxes containing carbon black which do not deposit an insulating film are available and they should be both esthetically and electrically satisfactory on the uniformly black floors. Sealers should not be used on conductive floors until proven satisfactory by extensive electrical tests.

There is a limit to the colors that may be used for hospital floors for the most commonly used conductive medium is acetylene black. However, terrazzo and other pattern effects can be used.

The electrical resistance of oxychloride floors depend on their moisture content, which in turn, is governed by the humidity in the air and by water added during washing. Results of tests given in this report indicate that if this material is used, the relative humidity of the air in the room in which it is installed, should be controlled and the cleaning schedule for the floor should be carefully established and maintained. As shown by tests, otherwise the electrical resistance of the floor may fall outside the accepted limits.

Results show that current specifications and methods of measuring the physical properties of nonconductive floorings are satisfactory for conductive floorings.

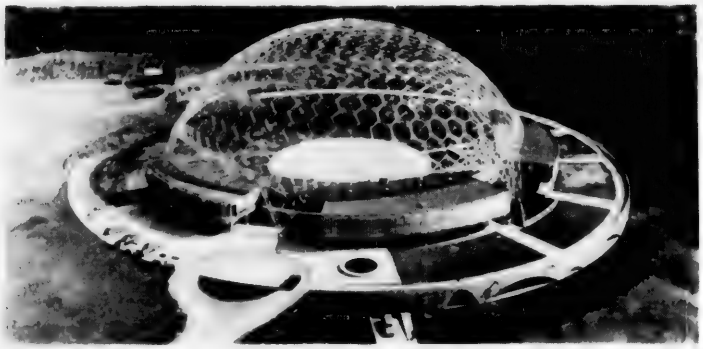
Results of this study indicate that the presently accepted method of measuring the resistance of installed floors, described in NFPA booklet No. 56, reasonably simulates the conditions under which a floor is expected to function as an electrostatic intercoupler.

Although the investigation was carried out primarily to evaluate conductive floors for hospital operating rooms, many of the results obtained should apply equally well to floors for eliminating electrostatic hazards in other locations such as industrial plants where explosive atmospheres may exist.

The authors of the original report are Thomas H. Boone, Francis L. Hermach, Edgar H. MacArthur and Rita C. McAuliff.

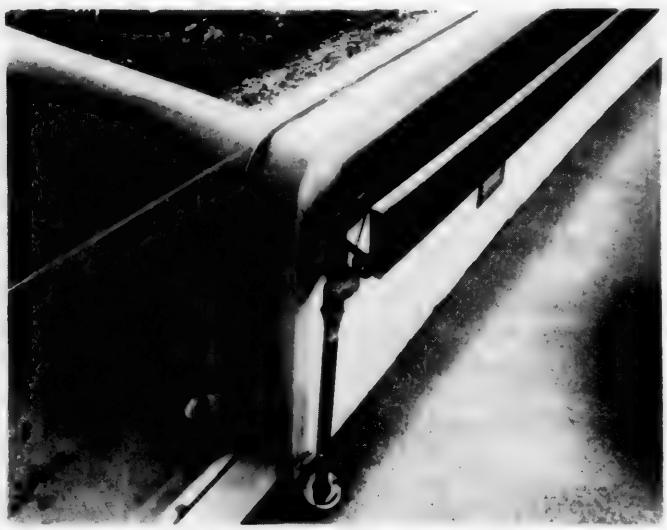
Picture Paragraphs

▼ NEW ASM BUILDING. The new headquarters building of the American Society for Metals, in Metals Park, Novelty, Ohio, 23 miles east of Cleveland, reflects a new era in the world of metals. Highlight is the Geodesic Dome, aluminum-alloy space lattice, which rises 103 ft and has a 250-ft diameter. Building itself is semi-circular, and some of its features are described below. Under dome lies "mineral garden" in which some 350 specimens of native minerals will be displayed.



► STAINLESS STEEL SUNSHADE. A unique stainless steel sunshade, constructed with 4000 louvers or "eyebrows", will protect the new ASM building from the direct rays of the sun. For every daylight hour throughout the year, this sunshade will effectively control both the temperature and interior lighting of the building except at exactly 4:30 P.M. on December 21, when the sun will be at its lowest point in the sky. Fabricator was Limbach Co., Pittsburgh, Pa.

Not shown here but visible in photo on cover is one of a series of stainless steel roof drainage "gargoyles" — a contemporary expression of an ancient way of handling water. These 5-ft troughs cascade water from the roof into gravel-filled catch basins on the terrace of the first floor level, which serves as roof for lower level.



◄ WOOD RADIATION PANEL. While the new ASM building is not air conditioned, three types of heating are employed: Warm air in ceiling and wall ducts (which permits air conditioning to be added later in the oversized ducts); radiant heat panels within the floor slab of the second floor to compensate for the major heat loss from the exposed underside of the slab; and "armchair level" fin tubing at the glass curtain wall to handle heat loss immediately. Wood radiation panel which parallels the tubing is an attractive architectural detail.

Architect: John Terence Kelly, Cleveland, Ohio.
Heating and ventilating engineers: Mayer and Valentine, Cleveland, Ohio.
Heating and plumbing contractor: Spohn Heating and Ventilating Co., Cleveland, Ohio.

ACHV REFERENCE SECTION

Air Distribution for Air Conditioning

JOHN W. MARKERT

Supervisor in Charge of Air Conditioning, Heating and Ventilating, Gibbs & Cox, New York, N. Y.

The basis of good air distribution design is both the experiences of manufacturers and engineers. Since performance is an important factor, the producers of air distribution units can provide valuable information and design short cuts. Here is a practical approach to air distribution, predicated on the author's extensive experience and on information released by manufacturers.

Air Distribution for Air Conditioning

JOHN W. MARKERT
Supervisor in Charge of Air Conditioning, Heating and Ventilating,
Gibbs & Cox, New York, N. Y.

PRESENT day air distribution depends mainly on experience backed up by experimental tests in mock-ups where this expense can be justified. The engineer must rely on his own personal experience and that of manufacturers who have earned his confidence.

Each manufacturer uses his own method of presenting selection data for his products. Some use graphs, while others employ tables. In the case of grilles and registers, there is not any significant difference in performance, since performance is a function of the same variables: Face velocity, vane setting, temperature differential and throw.

In the case of diffusers, there are many opportunities to vary performance and cost. This makes their selection more complicated both as to manufacturer and particular type of diffuser most suitable for a specific application.

To date perforated panel distribution has been limited, primarily by cost. Since there are relatively few manufacturers, selection of the unit is somewhat simplified, and the main problem that must be faced is based on details of installation.

Pan and slotted outlets are used so little in modern air conditioning that aside from mentioning them, nothing more need be said.

All in all, selection of the type and location of outlets for proper air distribution is usually a compromise involving cost, space limitations, architectural considerations, structural considerations, lighting, and quality of performance required.

Regarding cost, the various types of grilles or registers are cheapest. Diffusers, though varying considerably in quality, cover the intermediate cost range. Special features such as combination lighting and air diffusion can further add to the cost. Perforated ceilings usually cost the most.

Architectural considerations are always of prime importance for one reason or another.

Selection of Terminals

While selection data for various terminals is presented in different forms by different manufacturers, it is always based on the same criteria, namely:

1. Air volume
2. Velocity at verna contracta
3. Allowable throw for grilles, and radius of diffusion for diffusers
4. Mounting or ceiling height
5. Temperature differential
6. Acceptable air motion
7. Noise limitations

All of these criteria may not be clearly stated in catalogs so that complete comparisons between manufacturers may not be possible.

Regarding air volume, it may be said that the smaller the volume, the less chance for draft.

High velocities are necessary where the throw or radius of diffusion is large, to keep cool air from dropping and creating drafts in zone of occupancy.

High mounting (ceiling) heights are usually less conducive to drafts. However, where they are over 15 to 20 feet, care must be taken to prevent stratification of warm air. Low returns are essential in this case.

Temperature differentials are important during the cooling cycle since there is a direct relationship between these differentials and the tendency for the air to drop. Generally, with grilles the temperature differential should not exceed 15 deg F, except where sill distribution can be used.

Acceptable air motion is difficult to define, and when specified should be qualified by stating the type of instrument to be used for measuring this air motion.

Noise limitations are becoming increasingly important since more stringent noise criteria are being specified for air conditioning systems. However, except for sound studios and similar very quiet installations, it is not usually a significant factor. Throw, mounting height, and other selection criteria usually keep the outlet velocity down below levels which would be objectionable. This is not to say that noise is not transmitted through the outlet. As a matter of fact, grilles and diffusers are frequently blamed for noise generation from fans and other equipment. A simple way to evaluate this is to remove the outlet to see whether the noise level changes.

Apropos of this subject, special sound attenuating devices and dampers are required on high pressure and/or high velocity systems. A further discussion of this subject is not within the scope of this article for noise does not have any basic effect on air distribution within spaces and air outlet selection.

Supply Grilles

The discharge from a supply grille acts as a single jet. As such, it expands laterally in all directions at an angle of about 10 deg from the centerline. The aspect ratio has little effect on the pattern since the jet tends to form a circular pattern as the air travels into the room. Setting the vanes to converge only results in cutting down the effective area and as such will increase the throw accordingly. Setting the vanes in a diverging pattern will reduce the throw and will increase the pressure drop. With extreme settings, noise may be generated due to reduction in effective area and resultant high jet velocity.

The relation between throw of air in free space, outlet

velocity, and free area can be theoretically expressed. However, the introduction of discharge coefficients, temperature differential, and room configuration, complicates any such theoretical approach. Therefore, the use of manufacturers' catalogs must be resorted to and used with reasonable caution and experience. Figure 1 shows one method of presentation and this must be used with Fig. 2 which shows a quick method of determining drop caused by both expansion of air and temperature differential.

The following instructions are for use with Fig. 1.

1. For long throws and close center lines, use *A* or *C* deflection. For shorter throws and greater center line distances, use *E* or *G* deflection. For average conditions, use a *C* deflection setting.
2. Locate the required throw in feet and proceed horizontally to the intersection of the required cfm line. If this intersection does not fall directly on a vertical size line, proceed diagonally along the cfm line to the nearest size line. This is the operating point.
3. The jet velocity and the total pressure at the operating point apply to a *C* deflection setting. To determine the exact jet velocity for other deflection settings, multiply the jet velocity shown in Fig. 1 by the following factors: *A* deflection, 0.9; *E* deflection, 1.1; *G* deflection, 1.2. Using this new velocity, the equivalent total pressure can be read directly from the chart.
4. If the operating point is above the recommended velocity, proceed diagonally downward on the cfm line to a larger size grille within the recommended velocity limits. It is considered good practice to select supply wall grilles for a throw of approximately three-quarters of the room dimension, in the direction of throw. To prevent smudging, a distance of 12 inches between top of grille core dimension and ceiling is recommended. This also permits arching the air stream to keep it above the zone of occupancy. Naturally, arching of the air jet cannot be done where exposed beams or similar obstructions are in the way. Such obstructions will deflect the air downward causing drafts.

John W. Markert, supervisor in charge of air conditioning, heating and ventilating for Gibbs & Cox, Inc., attended Webb Institute of Naval Architecture and Polytechnic Institute of Brooklyn where he received a B.M.E. in 1934. Following a year at sea he was in the Ventilation Section of Gibbs & Cox for four years. He was with the U. S. Maritime Commission from November, 1938 to October, 1952 and when he left he was head of the Ventilation and Air Conditioning Section. For the next three years he was with York Corp. He returned to Gibbs & Cox in 1955 and he has been with the office up to date. He is a member of ASHRAE and is past president of the Washington, D. C. chapter. Papers by him have been published in the transactions of several naval and shipbuilding societies, and he has had many articles published in technical magazines.

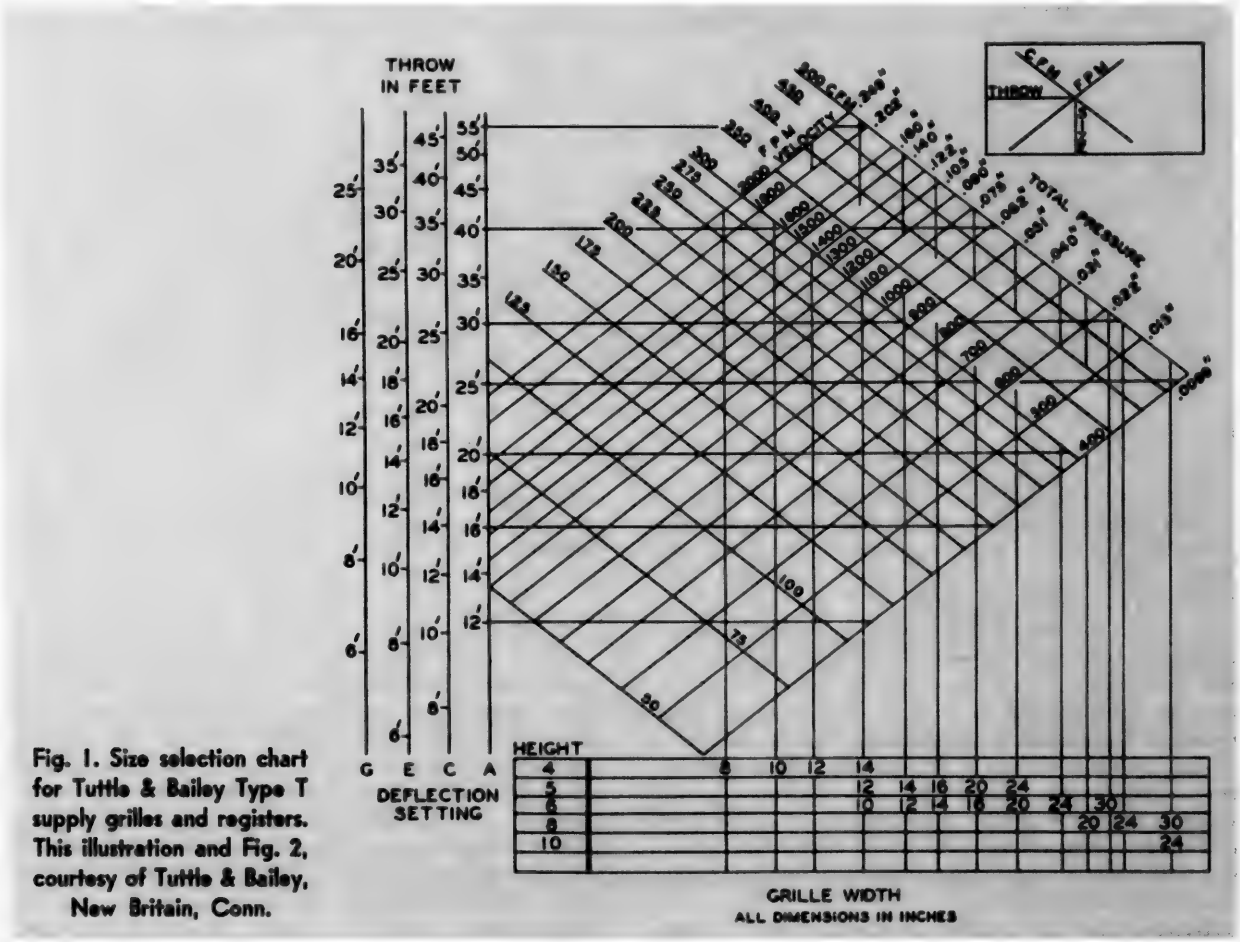


Fig. 1. Size selection chart for Tuttle & Bailey Type T supply grilles and registers. This illustration and Fig. 2, courtesy of Tuttle & Bailey, New Britain, Conn.

Air drops after ejection from a grille because of: (1) expansion of the air stream after it leaves a grille; and (2) temperature differential between the primary and secondary air. Failure to analyze what the drop will be may result in unsatisfactory distribution. If it is found that the air stream will fall into the occupied zone before the end of the throw, horizontal rear bars should be selected so that the air stream can be arched above the occupied zone. If such procedure is not possible, or where drop is exorbitant, another grille layout should be considered.

Instructions for use of Chart

A 16″ x 5″ grille with "C" deflection has been selected to discharge 225 cfm with an 18′ throw.

The resultant jet velocity of 600 fpm can be read from the Selection Chart.

PROBLEM: Determine the drop at 15° temperature differential.

SOLUTION: Lay straight edge on throw and velocity ordinates connecting values from example above (shown by dotted line). Total drop of air stream is found by adding drop due to temperature differential (D_t scale) and drop due to spread of the air stream (D_s scale).

$D_t = 4'$

$D_s = 2.25'$

therefore:

$D_{total} = 4' + 2.25' = 6.25'$

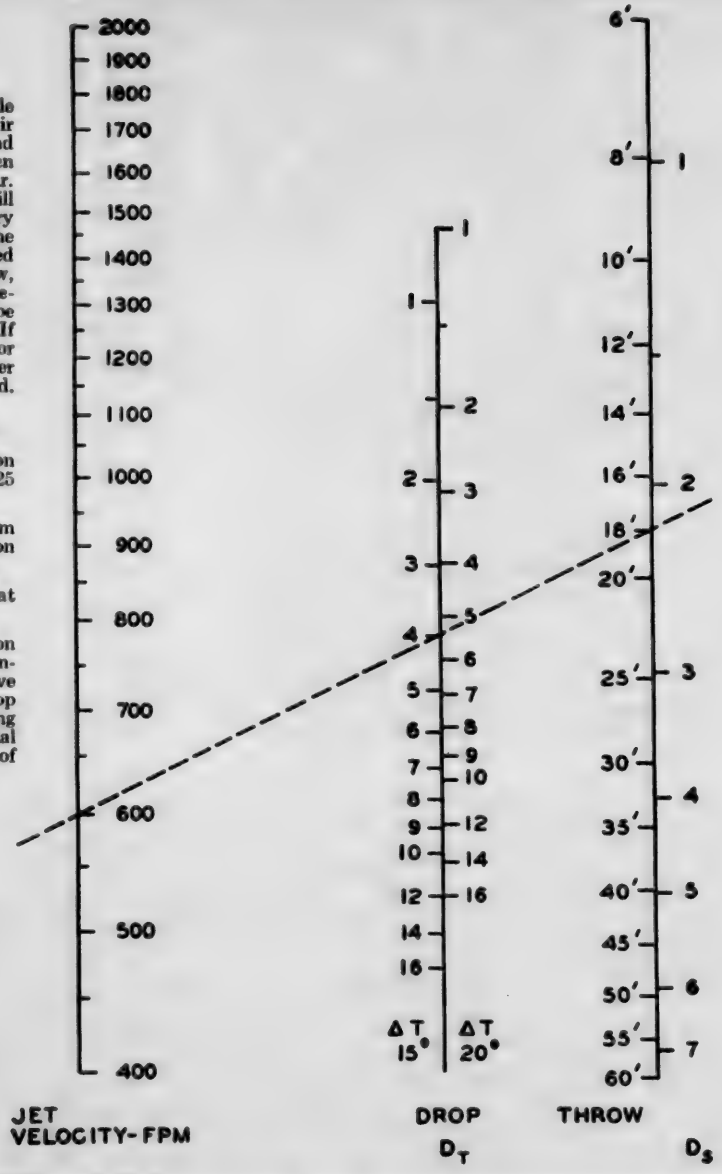


Fig. 2. Drop chart for supply grilles and registers.

Underblowing will cause the hot air to rise and stratify at the ceiling; this will result in excessive temperature variations. During the cooling season, the air will dump before temperature equalization is accomplished, and drafts and discomfort will result.

High side wall grilles are usually located in or near an interior wall and blow toward an exposed wall. While this arrangement works satisfactorily with cool air, it tends to aggravate the down draft of cold air at glass areas, and is particularly objectionable when outside temperature is below 40 deg F. This objectionable condition can be reduced by using storm sash or double glazed windows and by locating returns directly below the glass area to extract the colder air as it falls to the floor. However, even with this arrangement it will be uncomfortable to sit close to the window.

Return grilles and registers are usually sized on the basis of allowable velocity and pressure drop. The velocity is usually low enough to permit neglect of noise considerations, usually being in the range of 400-800 fpm. See Tables 1 and 2.

Return Intakes

Except where located under glass areas, when possible returns should be located away from chairs and furniture where people's feet and legs will be in the return air path. This is also good practice because the system noise will not be as readily detected by the occupants.

Except as previously mentioned, the location of returns does not effect general room air motion. However, it does contribute to temperature equalization. With heating, low returns are required, with high sidewall supply grilles. Floor returns have the disadvantage of becoming clogged with refuse. All returns, however, are dust

TABLE 1—RECOMMENDED RETURN INTAKE FACE VELOCITIES

Intake Location	Velocity Over Gross Area, Fpm
Above occupied zone	800 up
Within occupied zone, not near seats	600-800
Within occupied zone, near seats	400-600
Door or wall louvers	200-300
Undercutting of doors (through under cut area)	200-300

TABLE 2—APPROXIMATE PRESSURE DROPS FOR LATTICE RETURN INTAKES INCHES WATER GAGE — STANDARD AIR

Per Cent Free Area	Face Velocity, Fpm						
	400	500	600	700	800	900	1000
50	0.06	0.09	0.13	0.17	0.22	0.28	0.35
60	0.04	0.06	0.09	0.12	0.16	0.20	0.24
70	0.03	0.05	0.07	0.09	0.12	0.15	0.18
80	0.02	0.03	0.05	0.07	0.09	0.11	0.14

Tables 1 and 2 reprinted from the Heating Ventilating Air Conditioning Guide 1959, by permission of ASHRAE.

catchers and should be readily removable for cleaning. High (wall or ceiling) exhaust and return grilles assist the equalization of temperature when the grilles are located at or over heat sources which may not be large enough to justify hoods. Similarly, exhaust grilles can help confine odors such as bar and food.

Low Supply Outlets

Baseboard supply grilles and registers, with low outlet velocities, are commonly used for heating. They are not suitable for cooling since the cool air tends to stay at the floor level. There are a number of diffusing type grilles which are particularly suitable for residential work. And their use has been growing with the increasing

db →			30		36		43			50					57	db
SIZE	NECK AREA	RATING	NECK VELOCITY (in feet per minute)													
			700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	
4"	sq. in. 12.57	Capacity in cfm	61	70	78	87	96	105	115	120	130	140	150	155	165	175	
		Static pressure in. wg	.022	.029	.036	.045	.054	.065	.078	.091	.105	.118	.135	.150	.170	.190	
	sq. ft. .087	Min.—max. rad. diff.	3-5	3-5	3-6	3-7	4-7	4-8	5-9	5-10	6-11	6-12	7-13	7-14	8-15	8-16	
5"	sq. in. 19.64	Capacity in cfm	95	110	120	135	150	165	175	190	205	220	230	245	260	270	
		Static pressure in. wg	.033	.043	.055	.068	.083	.101	.119	.138	.161	.182	.208	.235	.263	.292	
	sq. ft. .136	Min.—max. rad. diff.	3-5	3-6	3-7	4-7	4-8	4-9	5-9	5-10	6-11	6-12	7-13	7-14	8-15	8-16	
6"	sq. in. 28.27	Capacity in cfm	135	155	175	195	215	235	255	275	295	315	335	355	370	390	
		Static pressure in. wg	.046	.060	.077	.095	.117	.142	.167	.196	.230	.260	.296	.332	.376	.420	
	sq. ft. .196	Min.—max. rad. diff.	3-6	3-7	4-7	4-8	5-9	5-10	5-11	6-11	6-12	7-13	7-14	8-15	8-16	8-17	
8"	sq. in. 50.27	Capacity in cfm	245	280	315	350	385	420	455	490	525	560	595	630	665	700	
		Static pressure in. wg	.037	.049	.063	.079	.095	.115	.136	.159	.183	.210	.238	.270	.300	.335	
	sq. ft. .349	Min.—max. rad. diff.	4-7	4-8	4-9	5-9	5-10	6-11	6-12	6-13	7-14	7-15	8-16	8-17	9-18	11-20	
10"	sq. in. 78.54	Capacity in cfm	380	435	490	545	600	655	710	765	820	870	925	980	1040	1090	
		Static pressure in. wg	.036	.047	.061	.076	.092	.112	.132	.155	.178	.205	.230	.262	.290	.322	
	sq. ft. .545	Min.—max. rad. diff.	6-12	6-13	7-14	7-15	8-16	8-17	9-18	9-19	10-20	10-21	11-23	12-24	12-25	13-27	
12"	sq. in. 113.10	Capacity in cfm	550	630	705	785	865	940	1020	1100	1180	1260	1330	1410	1490	1570	
		Static pressure in. wg	.051	.068	.088	.110	.134	.161	.190	.222	.258	.293	.335	.380	.426	.475	
	sq. ft. .785	Min.—max. rad. diff.	7-14	8-15	8-16	9-18	9-19	10-20	10-21	11-22	12-24	13-26	13-27	14-28	15-30	16-32	65
15"	sq. in. 176.7	Capacity in cfm	860	980	1100	1230	1350	1470	1600	1720	1840	1960	2090	2210	2330	2450	
		Static pressure in. wg	.044	.055	.067	.08	.095	.11	.125	.142	.16	.178	.195	.215	.24	.26	
	sq. ft. 1.227	Min.—max. rad. diff.	9-19	10-21	10-22	11-23	12-25	12-26	13-27	14-29	15-30	16-33	17-35	18-37	19-39	20-41	
18"	sq. in. 254.47	Capacity in cfm	1240	1410	1590	1770	1940	2120	2300	2470	2650	2830	3000	3180	3360	3530	
		Static pressure in. wg	.098	.122	.15	.18	.21	.245	.278	.315	.35	.39	.435	.48	.525	.575	
	sq. ft. 1.767	Min.—max. rad. diff.	11-23	12-25	13-27	14-29	15-32	16-33	17-35	18-37	19-40	20-41	21-43	22-45	24-49	25-52	
21"	sq. in. 346.36	Capacity in cfm	1680	1920	2160	2400	2650	2890	3130	3370	3610	3850	4090	4330	4570	4810	
		Static pressure in. wg	.039	.049	.06	.072	.084	.098	.11	.125	.14	.158	.175	.192	.21	.23	
	sq. ft. 2.405	Min.—max. rad. diff.	13-26	15-31	16-32	17-35	18-37	19-39	20-42	21-43	22-45	23-47	24-49	25-52	27-55	28-57	
24"	sq. in. 452.39	Capacity in cfm	2200	2510	2830	3140	3460	3770	4080	4400	4710	5030	5340	5650	5970	6280	
		Static pressure in. wg	.07	.09	.11	.13	.15	.175	.20	.225	.255	.285	.315	.345	.38	.415	
	sq. ft. 3.141	Min.—max. rad. diff.	16-33	17-35	18-37	19-39	20-41	21-43	22-45	24-49	25-51	27-56	29-59	31-62	32-65	34-68	
30"	sq. in. 706.86	Capacity in cfm	3440	3930	4420	4910	5400	5890	6380	6870	7360	7850	8340	8830	9330	9820	
		Static pressure in. wg	.06	.074	.09	.11	.127	.148	.17	.19	.215	.24	.265	.29	.32	.35	
	sq. ft. 4.908	Min.—max. rad. diff.	19-39	20-42	21-43	22-45	23-47	24-49	26-53	28-58	30-62	32-65	34-68	36-72	38-76	40-80	

Fig. 3. Selection of a diffuser — Anemostat Type CM-1. Courtesy of Anemostat Corp. of America, New York, N. Y.

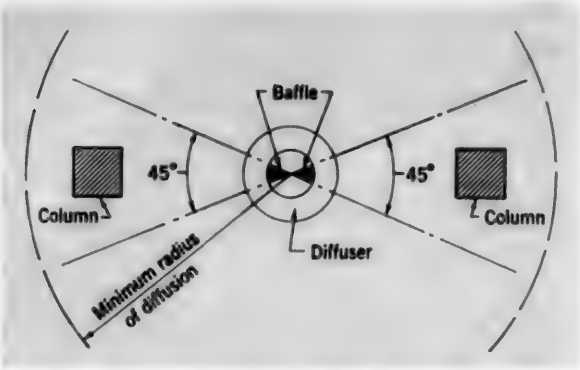


Fig. 4. Plan showing use of baffles in a ceiling diffuser.

application of cooling. In such applications, air changes and volumes are relatively small and, therefore, air distribution is not as difficult a problem. Diffusing grilles are best used by locating them under windows where they can blanket the large solar heat in summer and cold down drafts during the heating season.

Sill type air distribution has grown in popularity with the introduction of all air systems. In the past, the induction systems for office buildings (high and low pressure, reheating and/or recooling) had one great advantage in that during nights and weekends, the fans could be shut down and the units could act as radiators to prevent freezing and to limit the heating-up period. With other air systems, in cold climates, direct radiation was provided under windows to kill the down draft. In present day all air systems, sill type air distribution permits the omission of direct radiation, since the supply air blankets the cold exposure. Also, during off periods the fan speed can be reduced to save power, and 100% recirculation provided to reduce fuel consumption. Where dual duct systems are installed with separate hot and cold air fans, the latter can be shut down entirely.

Table 3 presents one manufacturer's method of selecting and installing sill grilles and Table 4 gives the relationship of noise level to sill grille length. Other manufacturers' recommendations should be followed for their products.

Diffusers

Diffusers, while more expensive individually, have superior performance characteristics than grilles in most cases. Generally speaking, fewer diffusers will be required so that the overall installation cost with high quality diffusers should not be significantly greater than that for grilles.

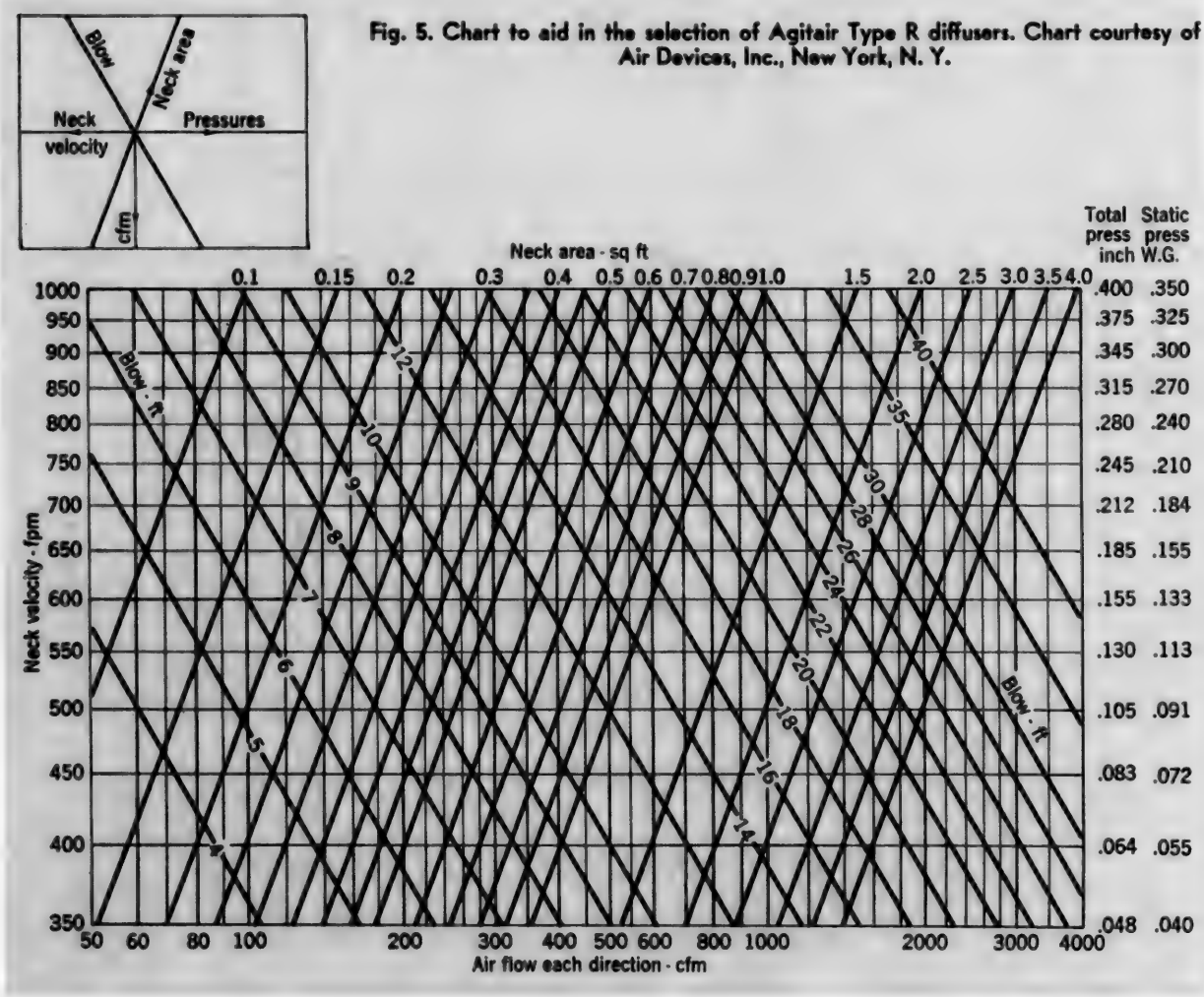


Fig. 5. Chart to aid in the selection of Agitair Type R diffusers. Chart courtesy of Air Devices, Inc., New York, N. Y.

TABLE 3 — DATA FOR SELECTING SILL SUPPLY GRILLES

BARBER-COLMAN MODEL ST

Net Face Vel., Fpm	Press. Drop, Inches of H_2O	NOMINAL GRILLE HEIGHT, in Inches										Noise Level, DB
		1¼		1½		1¾		2		2¼		
		CFM/Ft.	Throw, Ft.	CFM/Ft.	Throw, Ft.	CFM/Ft.	Throw, Ft.	CFM/Ft.	Throw, Ft.	CFM/Ft.	Throw, Ft.	
300	.02	—	—	—	—	25	1-2	31	2-3	37	3-4	—
350	.02	—	—	—	—	29	2-5	36	5-6	44	6-7	—
400	.03	—	—	25	1-4	33	4-9	42	9-10	50	10-11	18
450	.04	—	—	28	1-6	37	6-11	47	11-13	56	13-15	21
500	.05	21	1-2	31	2-7	42	7-14	52	14-16	62	16-18	23
550	.06	23	1-4	34	4-9	46	9-16	57	16-18	69	18-20	25
600	.07	25	3-6	37	6-11	50	11-18	62	18-20	75	20-22	27
650	.08	27	4-7	41	7-13	54	13-19	67	19-21	81	21-23	29
700	.09	29	5-8	44	8-16	58	16-21	73	21-23	88	23-25	31
800	.12	33	9-12	50	12-20	67	20-24	83	24-25	100	—	35
900	.15	37	12-16	56	16-23	75	23-26	94	—	112	—	37
1000	.18	41	15-20	62	20-25	83	—	104	—	125	—	40

Window sill application, grille discharging air 5 deg towards window. Grille 7 feet below ceiling. Throw based on 20 deg F. temperature differential for cooling, up to normal heating differential. Noise levels based on a 48-inch grille.

TABLE 4—RELATION OF GRILLE LENGTH TO NOISE-LEVEL

Length of the Grille in Feet	8	12	16	20	24	28	32	36	40
ADDITION in DB.	3	5	6	7	8	9	9	10	10

For grilles over 40 feet, add 10 DB.
Tables 3 and 4, courtesy of Barber-Colman Company, Rockford, Ill.

When originally introduced, diffusers were installed in ceilings only. Later high wall diffusers were introduced and more recently low wall, under window types of diffusers are placed.

The location and selection of ceiling diffusers is, in most cases, a compromise with lighting, architectural requirements, and similar considerations. Since these factors vary from building to building and room to room, there is no general rule that can be followed. For the same reason most diffuser manufacturers produce a variety of outlets.

One point that must be kept in mind when laying out systems for office buildings is flexibility. Tenant changes as well as rearrangements by tenants require that each bay have an outlet properly sized and located to accommodate a reasonable range of occupancy and load conditions. This usually is planned for in the original design to avoid costly changes later on.

The pressure drop for diffusers should be checked when making selections. However, in most cases this is not critical, except residential and similar small installations, because the fan characteristics are selected after the total system pressure requirements are established.

Diffuser Selection

The selection of diffusers is usually made by dividing the ceiling area into squares, or rectangles, with the largest side not over 1½ times the short side. The diffuser is located, where possible, in the center of the area. Unless there is a concentrated heat load, the volume

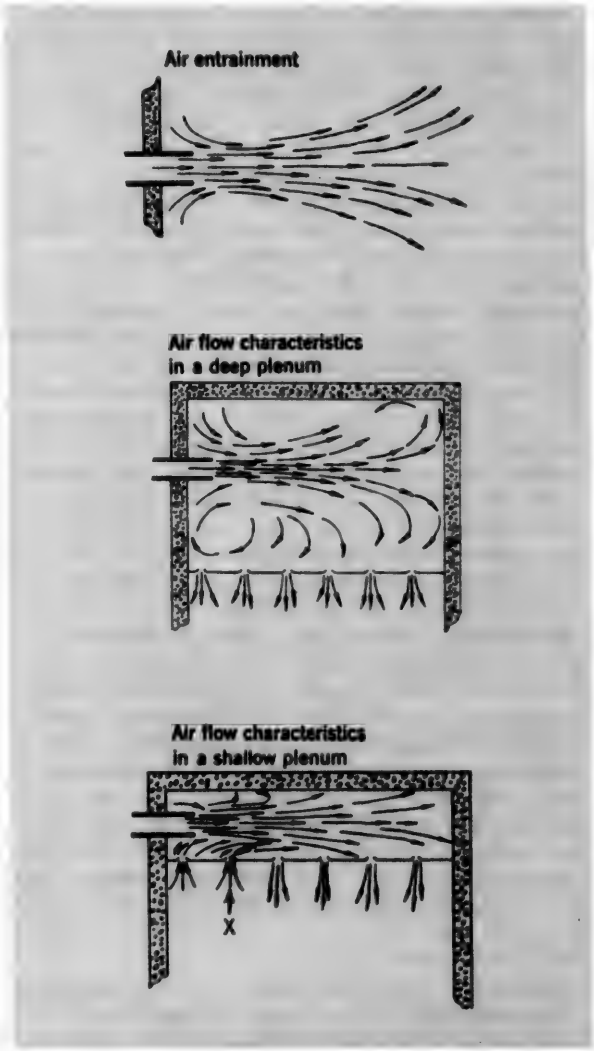


Fig. 6. Air flow characteristics. This and Fig. 7, courtesy of The Pyle-National Company, Chicago, Ill.

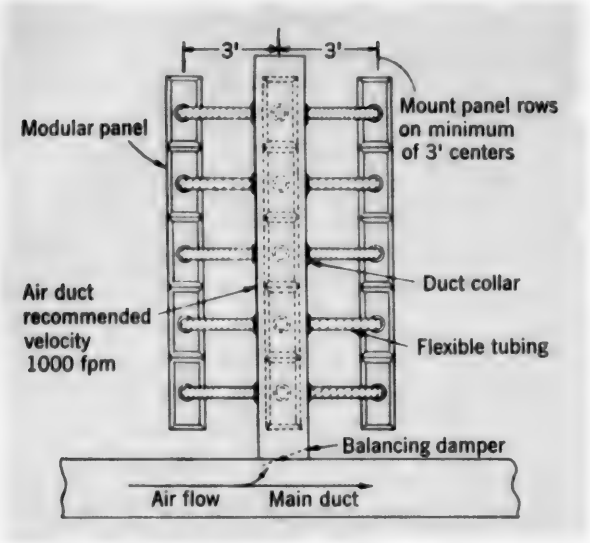


Fig. 7. Recommended modular layout.

handled by each diffuser serving the space will be the same. The distance between the walls and a diffuser determines its maximum and minimum radius of diffusion. If one-half the distance between adjacent diffusers is less than minimum distance to a wall, it should be considered the minimum radius of diffusion. Ratio of maximum to minimum distance from diffuser to wall should not exceed 1½. In some cases, the allowable terminal velocity is taken into consideration. Tables are usually based on a minimum mounting height and maximum cooling temperature differentials, with corrections for variations in these factors and heating. The noise characteristics should be checked; however, in most instances this is not critical to selection.

How a diffuser may be selected, is shown based on a 9 ft mounting height. As a design problem, let us assume that the diffuser is to be installed flush with ceiling. The room is 80 ft × 60 ft, total air quantity is 7200 cfm, and there is a 20 deg temperature differential. Each diffuser will serve an area of 20×20 ft. Therefore the number of diffusers required = 80 × 60/20 × 20 = 12. Each unit will handle 7200/12 = 600 cfm. From Fig. 3, an 8-inch, 10-inch, or 12-inch unit could be used, since all have diffusion radii within the required 10 ft. If it were an industrial application, the smallest size would be selected, since the noise would not be important, assuming a pressure drop of 0.25-inch water could be tolerated. If either exceptionally low pressure drop or sound level were involved, the 12-inch size would be best. Note, however, that the overall diameter of this diffuser is the same for both 10 and 12-inch size, so there is no disadvantage in using the more conservative selections.

Selection charts are prepared by other manufacturers and are in either graphical or tabular form.

Baffles

Baffles used to prevent drafts from air deflected by projections, such as lights and columns, should be at least 45 deg to be effective. These have the same effect as reducing the size of the unit. For instance, if a diffuser handling 600 cfm with 10 foot radius of diffusion is to be located between two columns, Fig. 4, it is selected for an equivalent volume of 800 cfm.

$$600 \times \frac{360}{360 - (2 \times 45)} = 800 \text{ cfm.}$$

Regarding baffling, it should be noted that where for architectural reasons the diffuser's discharge must be restricted, a directional type diffuser may prove advantageous. In these cases we cannot take advantage of the optimum mixing ability of the round neck which provides full 360 deg energy distribution. It should be noted that the air quantity delivered in *one direction* is a criteria of selection, as well as the usual ceiling (mounting) height and temperature differential. Refer to Fig. 5, for a 600 cfm diffuser discharging 300 cfm, 10 feet in each of two directions, requires a neck velocity of 550 fpm and a neck area of 0.55 sq ft.

Perforated Ceiling Panels

Perforated panels, in a true sense, are not diffusers. Actually they are multiple jets and act the same as a grille in that the jets coalesce and act as a single stream. For this reason, the panel areas must be broken up into relatively small linear areas to provide maximum mixing and minimum differential and air motion. An adverse affect results when panel areas are located too close to a wall. This causes excessive velocity in zone of occupancy.

The panels are favored by architects because they are inconspicuous, particularly where acoustical ceilings are required. In some cases, however, they may become stained, either from condensation and/or dirt.

Although a panel application seems simple, it requires very critical distribution and equalization of air over the entire area to obtain the low jet velocities inherent to satisfactory performance. Therefore, the secret of this method of air distribution lies in the perfection of the distribution grid or valve above the perforated panel. It is not possible to obtain satisfactory performance by merely using perforated plate sections as a false ceiling. Unequal pressures and induction of primary jet will cause unequal flow and dirt deposits. See Fig. 6. The use of perforated panel distributors is most advantageous where there are high internal heat loads and corresponding high rates of air change.

Like other forms of linear distribution, a plenum with low velocities is used as a source for the individual sections. See Fig. 7.

Free area through perforations varies from 5% to 10% of gross area, depending upon the material used. Smooth surfaces have an advantage for cleaning. It is considered best to use low returns with perforated ceiling panels, particularly where they are also used for heating.

Figure 8 shows one manufacturer's chart for use with diffusion panels. To determine the air penetration in feet below the ceiling, let us take a design problem where there is 60 cfm per unit, 1300 Btu cooling per unit per hour, and a diffusion temperature differential of 20 deg. Use the left chart, at 20 deg differential move vertically to the 60 cfm line, then across to the 60 cfm line on the right chart and drop to find that the penetration is 3.2 ft.

Miscellaneous Matters

There is nothing "cut and dry" about air distribution. Therefore, it is also not possible to cover all of the

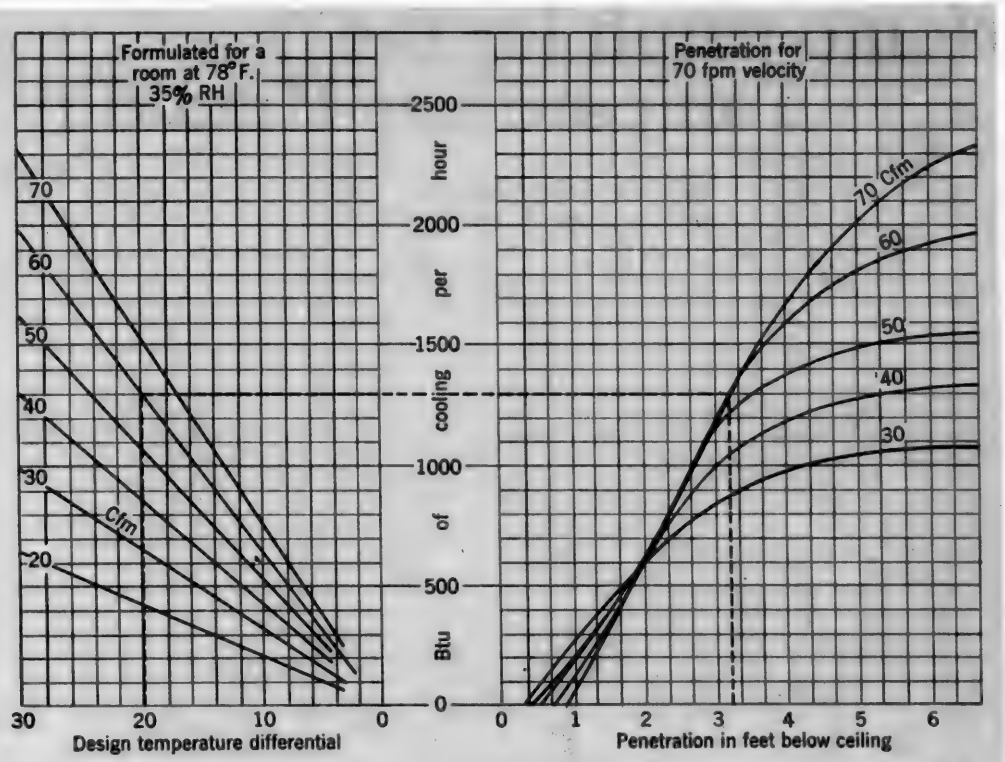


Fig. 8. Chart for linear multi-vent type MVL panel. Courtesy of The Pyle - National Company.

various ramifications in one simple article.

The question of noise is becoming increasingly important. However, in general, terminal noise is not significant. This is evidenced by the fact that noise correction methods have centered around:

1. Reducing noise and vibration from rotating equipment.
2. Eliminating noise generated by high duct velocities.
3. Eliminating noise created by various balancing devices such as air valves and dampers.

Higher speed machines, higher pressures and velocities in duct systems have increased the noise problem. Nevertheless, in spite of this, it is generally considered that air distribution systems installed today are on a whole quieter than those installed 10 to 15 years ago.

The question of balancing air systems is indirectly associated with the subject. If too little or too much air is delivered by an outlet, it cannot perform as anticipated. Exceptional noise often will be the first thing noticed. If the noise exists after the outlet is removed, a check should be made to see if velocities are equalized across the duct or collar serving the outlet. In the case of supply grilles, when the air turns at right angles to enter the outlet, extreme conditions can actually produce zero or negative flow in part of the grille face.

Often, particularly for small installations, delivery through the individual outlets is not considered important so long as temperatures are equalized throughout the space and no complaints are made of drafts. With large installations, however, where many spaces are served by the same system, a proper air balance between spaces is essential to assure that each receives adequate cooling and heating.

The first step in balancing, is to establish a reliable method for measuring the air flow from each outlet. This procedure is well established and is relatively simple for grilles and registers. However, it is quite difficult or impossible to use an anemometer directly with most diffusing terminals. As a result, other instruments of questionable accuracy must be employed, unless calibrated gathering cones are available for use with an anemometer. If measurement of air volumes is to be made, accurately using the diffuser manufacturer's factors, it is strongly recommended that these be checked in a laboratory before being accepted.

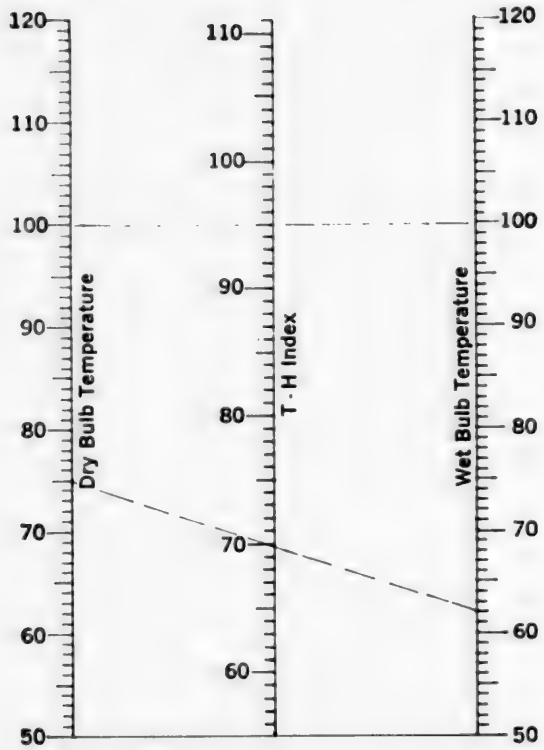
In balancing systems it is essential to impose a minimum of air resistance at each terminal. Therefore, after having established the method for determining air volume from each outlet, it is next necessary to balance them in proportion to each other, without considering the actual design cfm. A tolerance of from 5% to 10% plus or minus, is usually acceptable.

After the terminals have been balanced, a total system reading is taken at a point where this determination is considered most reliable—weather inlet, across fan, or other section handling total air — depending on layout. Theoretically the sum from the individual outlets should equal the system sum. However, this is seldom the case and, therefore, the engineer must decide which measurement he considers most accurate.

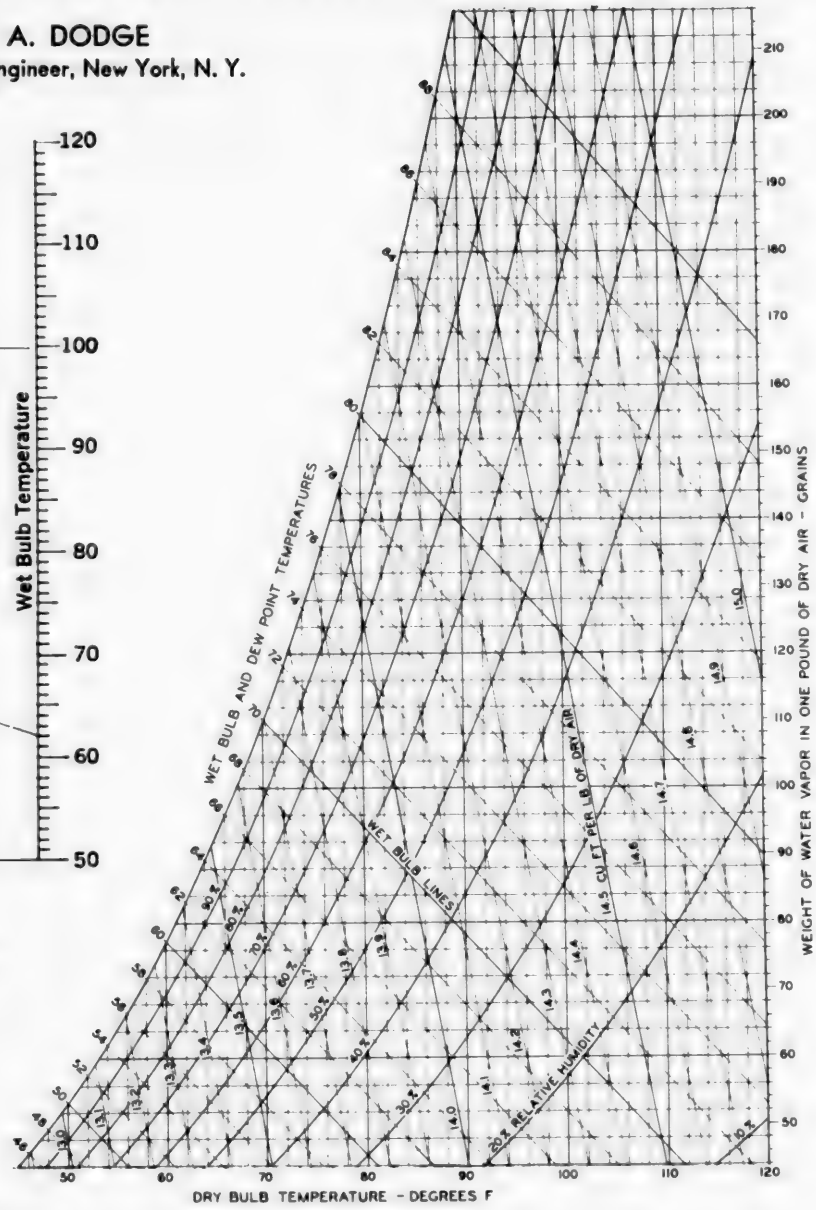
Having established the total delivery, the fan speed should be adjusted up or down as required, and motor input checked for overload. Note that with the above procedure, dampers or air valves to individual terminals are not throttled to take care of general system over delivery. Thus, throttling and associated noise generation are minimized, which is most essential.

Nomograph for the Temperature-Humidity Index

H. A. DODGE
Consulting Engineer, New York, N. Y.



Example: Given 75 deg db, 62 deg wb. Solution: Draw a line from 75 on the dry bulb scale to 62 on wet bulb scale. Line crosses T-H Index at 69.8.


WET BULB AND DEW POINT TEMPERATURES
WET BULB LINES
14.5 CU FT PER LB OF DRY AIR
20% RELATIVE HUMIDITY
DRY BULB TEMPERATURE - DEGREES F
WEIGHT OF WATER VAPOR IN ONE POUND OF DRY AIR - GRAINS

The above nomograph provides solutions for the Temperature-Humidity Index given simultaneous pairs of dry bulb and wet bulb temperatures, according to the formula,

$$THI = 0.4\ (db + wb) + 15.$$

Used in conjunction with the accompanying psychrometric chart, THI values may be found given any two of the psychrometric variables, such as wet bulb and dew point, dry bulb and relative humidity, dry bulb and humidity ratio, etc.

It is an interesting fact, which the reader may verify for himself, that lines of constant THI can be drawn on the psychrometric chart, and that these lines are approximately straight and that they closely parallel lines of constant specific volume. Thus, if a certain set of conditions, selected for comfort purposes, are found to be inconvenient for any reason, the designer, having located this condition on the psychrometric chart, may choose another condition in the same area of the chart along the constant specific volume line going through that point, with assurance that the comfort criterion has not been sacrificed.

The author has made copies of the above nomograph-psychrometric chart on a larger scale than reproduced here. He will gladly send a copy to anyone interested, on receipt of twenty-five cents in stamps to defray the cost of postage and envelope. It will be sent unfolded. His address is 250 East 43rd Street, New York 17, N. Y.

ESTIMATING GUIDE—REFRIGERATION AND AIR CONDITIONING

Concluded from last month's Reference Data Sheet. Data, supplied by York Corporation, are rough estimates of 1957 costs to the ultimate consumer.

Application	Engineering Data	Pricing Guide
29. Office Buildings	100 sq ft per person; 3-6 watts lighting per sq ft; 250 sq ft floor area per ton refrigeration.	$600 to $1500 per ton refrigeration.
30. Oil Refining	Follow data in October Reference Data Sheet.	Follow data in November Reference Data Sheet.
31. Printing and Lithography	75-77 deg db—45-50% rh close tolerances. Year around conditions. Figure 200-300 sq ft floor area per ton.	$800 to $1000 per ton for complete bill of material. $600 to $800 per ton for smaller and simpler installations.
32. Refrigeration and Air Conditioning	Follow data in October Reference Data Sheet.	Follow data in November Reference Data Sheet.
33. Residences, Apartments		
(a) Residences or Individual Apartments	500-800 sq ft floor area per ton refrigeration.	$400 per ton and up for cooling.
(b) Apartment buildings	600-800 sq ft floor area per ton refrigeration.	$600 to $1500 per ton refrigeration.
34. Retail Stores, Other	250-450 sq ft floor area per ton refrigeration.	$600 to $900 per ton for cooling.
35. Ships		
(a) Marine Ship's Service (35 Deg)	1000 cu ft room volume per ton refrigeration (up to 2000 cu ft); 1500 cu ft room volume per ton refrigeration (above 2000 cu ft).	$3,500 per ton for refrigeration system, fob shipping point, up to one ton; $3,000 per ton above one ton (per U. S. Maritime specifications which call for spare equipment for all movable parts plus 100% reserve).
(b) Marine Cargo Space (35 Deg)	1000 cu ft room volume per ton refrigeration.	$1,200 per ton fob shipping point. Does not include sea water piping or pumps, brine piping or pumps, or insulation.
(c) Marine Cargo Space (0 Deg)	2000 cu ft room volume per ton refrigeration.	$1,500 per ton for refrigeration system, fob shipping point in accordance with maritime specifications. Does not include sea water piping or pumps, brine piping or pumps, or insulation.
36. Shoe Stores	250-350 sq ft floor area per ton.	$600 to $700 per ton for cooling; $150 to $250 per ton for heating; $750 to $950 per ton for the complete bill of material.
37. Textiles		
(a) Full Fashioned Hosiery Mill	Knitting room: 80 deg db, 45-50% rh, inside close tolerances. Figure 180 sq ft for each 32 section knitting machine; 280 sq ft per ton refrigeration; 3.6 tons per 1000 sq ft floor area; 0.65 tons per 32 section knitting machine. For looping and seaming area, figure standard comfort conditions. For boarding and pre-boarding area and finishing area, figure standard comfort conditions. Note: Above based on all windows being bricked up and with insulation on ceiling. Alternate—glass blocks in lieu of windows.	$550 per ton or $200 per sq ft for complete bill of materials, knitting area; $500 per ton for complete bill of materials for entire mill.

Application	Engineering Data	Pricing Guide
38. Theatres or Auditoriums		
(a) Theatres	Air circulation 25 cfm per person. Outside air—5-7½ cfm per person; 55-60 tons per 1000 seats; 15-18 seats per ton refrigeration. Low noise level in church auditoriums and radio studios.	$12 to $15 per seat for refrigeration system, $25 to $35 per seat for complete bill of material.
(b) Libraries	Inside conditions—80 deg db and 50% rh.	$850 to $1000 per ton for complete bill of material.
39. Variety Stores	With lunch counter—150 to 250 sq ft floor area per ton. Without lunch counter—250 to 350 sq ft floor area per ton.	$600 to $700 per ton for cooling; $125 to $175 per ton for heating; $725 to $875 per ton for the complete bill of material.
40. Miscellaneous		
(a) Metal Industries	Precision instruments and parts, 75-80 deg, and 45-50% rh year-round.	$850 to $1000 per ton for complete bill of material.
(b) Skating Rinks (Indoor Only)	½ ton per 100 sq ft rink area—slow freeze. 1 ton per 100 sq ft rink area—quick freeze. 4 linear ft of 1¼-inch pipe per sq ft of rink.	$6.00 per sq ft rink area for refrigeration system. Add $2.50 to $3.50 per sq ft rink area for patented all-surface floor.
(c) Cold Test Rooms	100 to 400 cu ft per test room.	Complete Bill of Material

Tons Refrigeration	Room Temperature, deg F				
	—40	—60	—67	—80	—100
2- 9	$6,500	$11,500	$13,500	$17,500	$24,000
10- 49	5,000	7,000	8,000	10,000	15,000
50-249	4,000	5,000	6,500	8,000	12,000

COST DATA-REFRIGERATION AND AIR CONDITIONING PIPING

These data are to be used in conjunction with the data published in the November, 1959 Reference Data Sheet, and applies to any air conditioning or refrigeration installation. The costs shown are already included in the series just concluded, which series gives overall costs for complete, specific types of installations.

Cost of Hot and Cold Water Mains*

Main Size, Inches	Price per Ft	Main Size, Inches	Price per Ft
½	$0.95	3	$1.55
¾	1.00	4	1.95
1	1.05	5	2.50
1½	1.20	6	3.30
2	1.30	8	3.90
2½	1.40	—	—

* (Including fittings) Insulated with 1½ inches molded foam glass (18 inch lengths) cemented in place and banded seams filled with mastic, entire surface painted with emulsion.

Cost of Condenser Water Mains*

Tons of Refrigeration	Cost	Line Size, Inches	Additional Cost For Labor per Floor
100	$ 775	4	$ 90
100-200	880	5	105
201-350	1,015	6	125
351-700	1,225	8	150
701-1000	1,750	10	220

*Black steel welded with box strainers and valves.

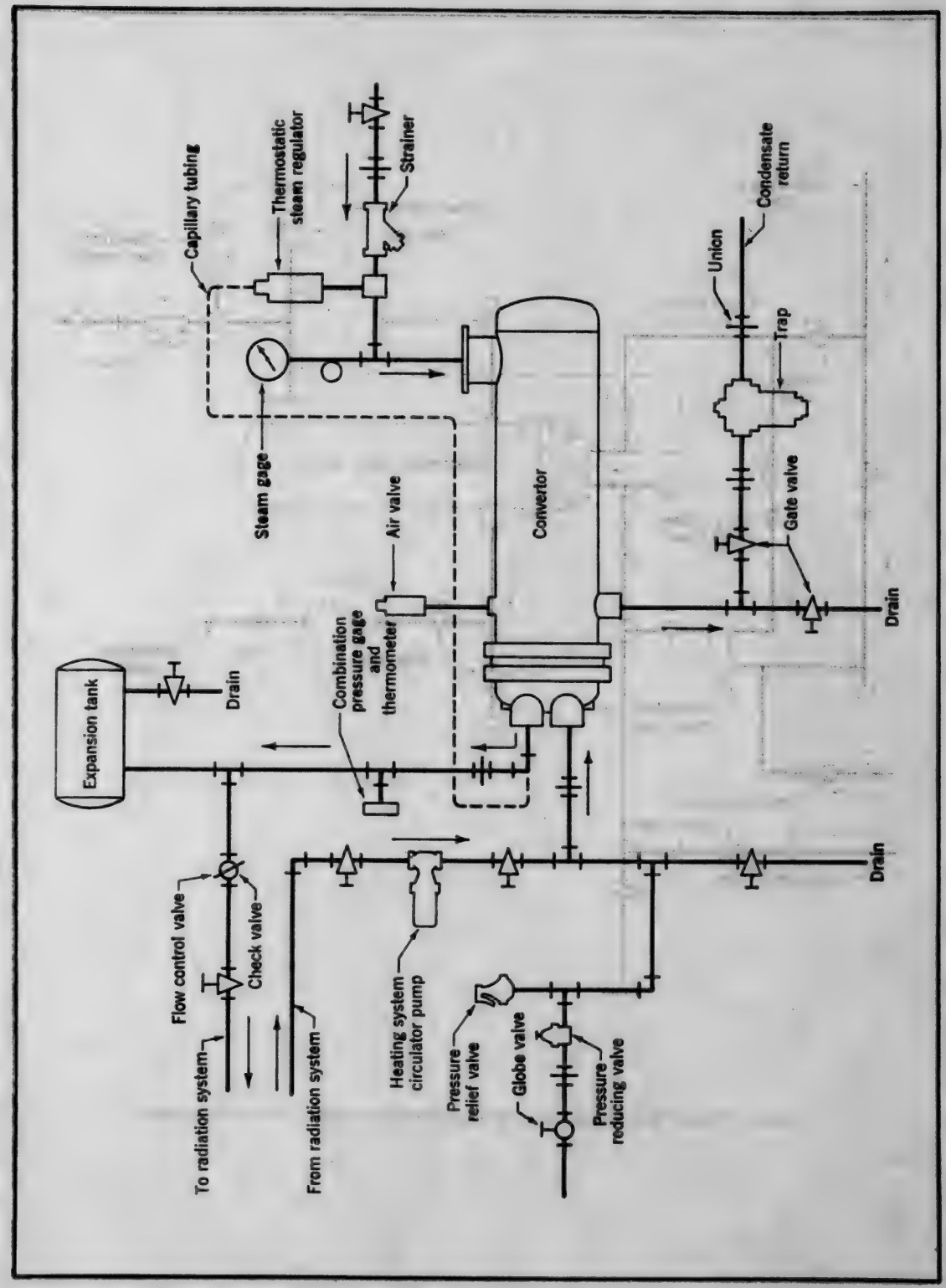
Cost of Horizontal Drains*

Drain Size, Inches	Price per Ft	Drain Size, Inches	Price per Ft
½	$ .40	2	$ .52
¾	.42	2½	.56
1	.45	3	.63
1½	.50	4	.76

*Drains (Horizontal) (Fittings—1½ feet). Insulated with 1-inch sectional wool felt pasted and banded.

PIPING FOR HOT WATER SPACE HEATING SYSTEMS

Converter Uses Steam as Heat Source

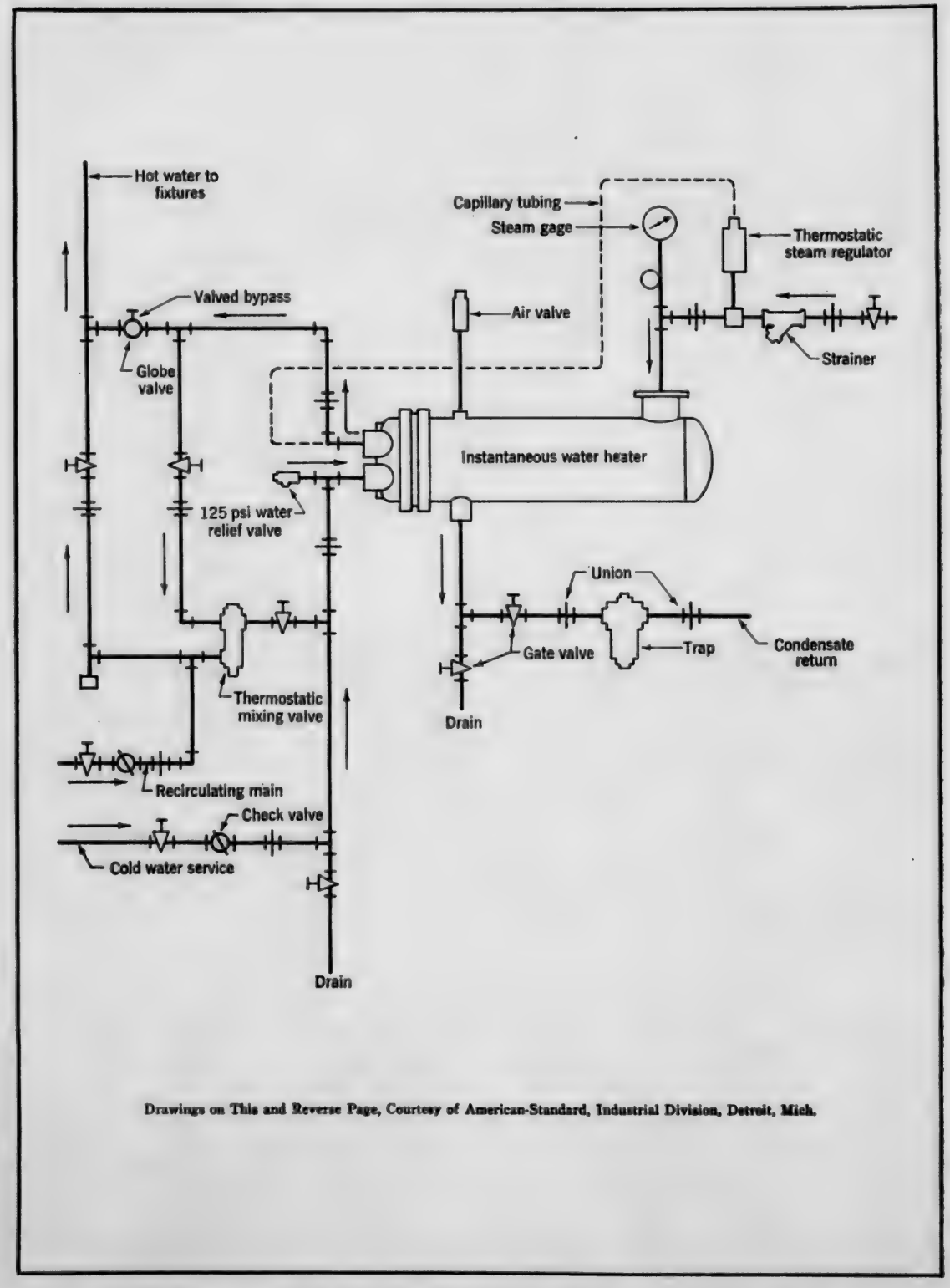


DETAIL SHEET—AIR CONDITIONING, HEATING AND VENTILATING

March, 1960

PIPING FOR SERVICE HOT WATER SYSTEMS

Instantaneous Heater Supplies Large Water Demand



Drawings on This and Reverse Page, Courtesy of American-Standard, Industrial Division, Detroit, Mich.

DETAIL SHEET—AIR CONDITIONING, HEATING AND VENTILATING

March, 1960

Methods for Hanging Ducts

WILLARD C. JANES
Sheet Metal Specialist, Northeast Region, Carrier Corp.

While justifiable attention has been given to the fabrication of ducts for both air conditioning and heating systems, not enough interest has been displayed as to the best means for properly supporting risers, and suitable hangers for horizontal ducts. Both rectangular and round ducts are commonly used as part of a ductwork system.

RECTANGULAR duct, horizontally erected in industrial buildings where beams and purlins are exposed, can be supported in a number of ways, as illustrated in Fig. 1. The hanger can be secured to the building member by a friction lug, a "C" or beam clamp, or by crossing an I-beam, and hooking the hanger stock over and around a flange. If ducts or headers cannot be spaced to follow the structural layout of the building, a bridge between purlins can be employed.

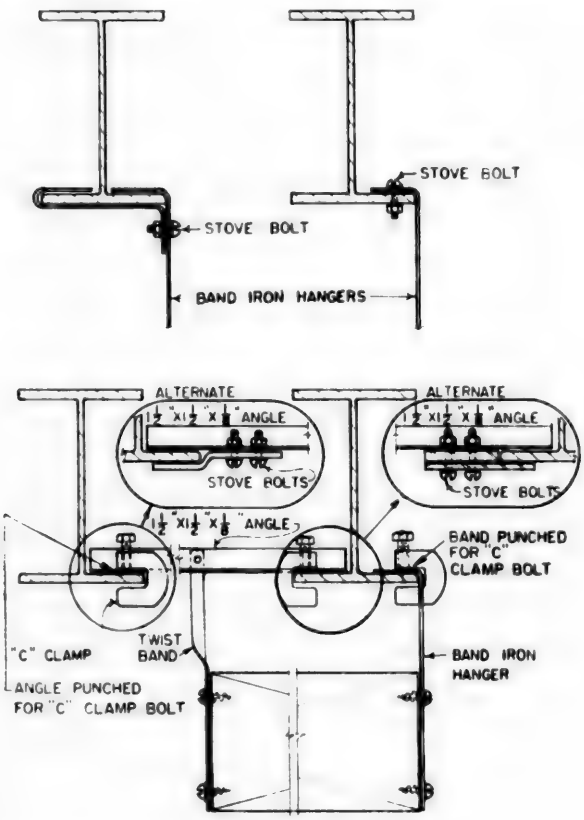


Fig. 1 (above). Hangers for a steel structure.

Hangers can be secured to wood members of adequate strength by screw nails or lag screws used in shear.

Where concrete beam and slab type building construction has not been prepared with hanger inserts before pouring, there are several anchors that can be used. They are: Drive nail with shield, anchor shield with bolt, shield with lag screw, jute plugs for sheet metal or wood screws, and powder-actuated type anchor.

Rectangular ducts, vertically installed as interior risers, can be supported at the floor level by sturdy angle iron brackets spanning the floor opening and fastened to the risers. In between, the duct can be steadied with a band or angle iron secured to the masonry and riser.

Risers along exterior walls should be supported by knee brace type brackets made of angle iron, spaced on not more than 10 ft on centers. These can be secured to the structure with one of the fasteners previously mentioned.

Spiral conduit or round ducts can be supported from the structure by one or two-piece band iron hangers, Figs. 2 and 3. Generally, single bands are used for ducts with diameters up to 60 inches; over this, two bands are best applied.

For supporting header ducts, wrap a strip of band iron around the duct and fasten it to an angle saddle stand, Fig. 4. When installed on a roof, extra tie rods or sway braces may be needed to compensate for extreme weather conditions. Hangers for horizontal runs of header ducts can be fastened to the structure in much the same way

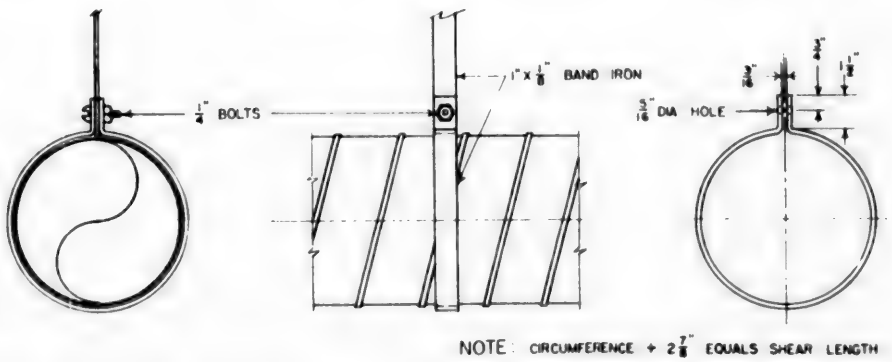
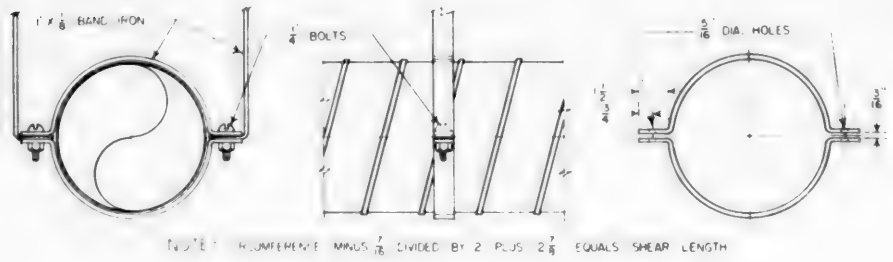


Fig. 2 (right). One-piece band iron circle hanger.

Fig. 3. Two-piece band iron circle hanger.



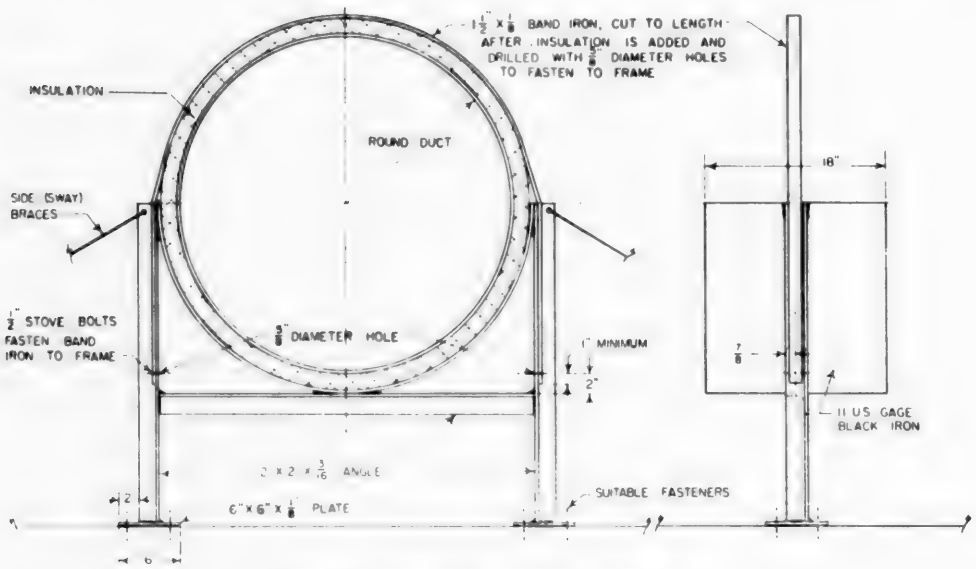


Fig. 4. Angle saddle stand for round duct.

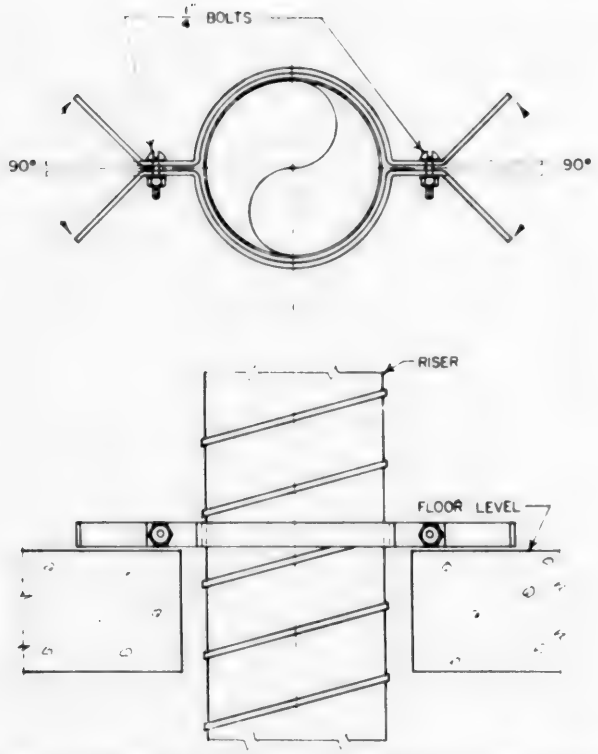


Fig. 5. Method for supporting a round riser with a two-piece hanger.

as indicated for rectangular ducts.

Round risers can be supported by a two-piece hanger held together by two bolts, Fig. 5. If insulation, sound absorbers or other items add substantial weight, supplemental or heavier hangers are required.

Here is additional information, while not concerned with hangers, that may be helpful.

When calculating total weight of a duct system, 15% of the net weight is customarily added to cover hangers, slips and scrap. The more difficult weight calculations of duct bracing or stiffening members should be done separately.

Where weight is critical, aluminum sheets of 2S and 3S type alloy and ¾ hard temper are readily workable and can be used for practically all ductwork. The 2S type (commercially pure) is suitable for all except very large ducts. For these, 3S alloy with ¾ or ½ hard temper is frequently used.

Aluminum joints can be of any standard design and fabricated in the same manner as iron. Repeated sharp bending and re-bending must be avoided because aluminum has a tendency to crack under such treatment. Aluminum of 16 B&S gauge or heavier can be readily welded by the metallic arc or acetylene process. Riveting is done in the same manner as with iron or sheet steel. Do not use self-tapping screws as they tend to loosen because of aluminum's softness.

All illustrations for this article have been copyrighted by Carrier Corp.

ASHRAE Convention Papers

draw large attendance at Dallas, Tex.

APPROXIMATELY 2,500 persons, consisting of members, guests and ladies, attended the semi-annual meeting of the American Society of Heating Refrigeration and Air-conditioning Engineers held in Dallas, Texas, February 1 to 4. Meetings were held in the Baker and Adolphus hotels and the second Southwest Heating and Air-conditioning Exposition was staged in the Memorial Auditorium, a few blocks from the hotels.

D. D. Wile

New Officers

The new officers to serve for a six-month terms are D. D. Wile, president; Walter A. Grant. first vice president; R. H. Tull, second vice president; J. Everetts, Jr., third vice president; F. Y. Carter, treasurer and R. C. Cross, executive secretary.

Mr. Wile, vice president and chief engineer of Recold Corp., Los Angeles, has been associated with the society since 1934 and has served on many of its committees.

Papers

The program consisted of four technical sessions and two symposiums. Abstracts of papers of wide interest for this field are abstracted.

A paper on A Method of Comparing Heat Exchangers was presented by Donald G. Rich, senior research engineer, Carrier Corp., Syracuse, N. Y. It is based on a method developed by Alfred E. Stacey, Jr., and C. M. Ashley, both with Carrier Corp. While considerable judgment is still necessary with the use of this system, the following six advantages are claimed:

1. This system allows comparisons to be made under identical heat transfer and friction performance conditions.
2. The effects of tube side heat transfer coefficient and metal thermal resistance, which can be important to the selection of an optimum geometry, are easily included.
3. It can be used to optimize surface area or any other parameter which is directly proportional to surface area. Results obtained can be interpreted quantitatively.
4. The coil rating factor is not dependent upon the parameter being optimized. It permits graphical comparisons of surface areas, weights, volumes, etc., using a single abscissa.
5. An additional curve for each heat exchanger provides both a face velocity and face area comparison.
6. Lines of constant friction power per unit surface area are easily included.

Noise Reduction

A paper on Noise Reduction Characteristics of Package Attenuators for Air Conditioning Systems was presented by Norman Doelling, consulting engineer with Bolt. Baranek & Newman. Data were presented on octave band noise reduction of commercial prefabricated package attenuators. With the data presented in the paper, it is possible to estimate the important noise reduction characteristics of other units. Information presented in this paper covers an experimental test technique for describing the noise reduction of package attenuators.

In the paper is a description of the physical mechanisms by which noise reduction is obtained, and also a comparison of the noise reduction vs. frequency characteristics of 20 commercially available prefabricated units.

The author also presents some guides for quickly selecting package attenuators to solve a specific troublesome noise problem.

Weather Design Data

H. C. S. Thom, chief climatologist, U. S. Weather Bureau, prepared a paper on A Rational Method of Determining Summer Weather Design Data. It is demonstrated in the paper that the dry and wet bulb design values may be chosen independently at a given probability level which will then be the design outdoor air load probability. A weather design variable is developed which limits the risk of exceeding design conditions within summers as well as through years.

The climatological analysis of this type variable is given by means of which illustrative wet and dry bulb temperature design data were calculated for Chicago, Ill., Fort Worth, Texas, Miami, Fla., New Orleans, La., New York, N. Y., Philadelphia, Pa. St. Louis Mo. and Washington D. C.

A Study of Drapes

N. Ozisik and L. F. Schutrum of the ASHRAE Research Laboratory prepared a paper on Solar Heat Gain Factors for Windows With Drapes. A number of different drapery materials was studied and an equation presented whereby the total heat transferred through glass and drape can be calculated. The solar heat gain through a single glass with a drape can be obtained by multiplying the incident solar radiation on the glass by the solar heat transfer factor, K. The K factors are given with different drapes for an ordinary window, a regular plate and a heat absorbing glass.

It was found that the solar reflectance of a material on the glass side excludes more solar heat than a material with a low reflectance.

The authors also found that the effectiveness of glass and drape combinations can be compared directly by their K factors.

(Concluded on page 144)

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Upper Floor Cleanouts

LAST month's article covered floor type cleanouts and how they were utilized at the lower floor levels in the building to clear underground drainage lines of any stoppages. This article discusses the type of cleanout installations that are employed at the upper floor levels in a building. These cleanouts offer access to the vertical soil, waste and leader lines as well as the horizontal branch lines that are connected to such vertical lines.

Stoppages that occur in the vertical or branch lines can be quite troublesome since plumbing fixtures may overflow and cause considerable damage; stoppages present a serious hazard to public health in the building. It is therefore extremely important that such stoppages be cleared as quickly as possible. This can only be accomplished by the careful placement of cleanouts to offer access to all parts of the system.

Location of Cleanouts

The general placement of the necessary cleanouts is illustrated in Fig. 1. Numbers indicate the various locations where cleanouts have been placed in the system. These locations are indicated by the following numbers:

1. Stack terminal.
2. P-trap at service sink.
3. P-trap at lavatory.
4. End of branch waste below floor.
5. End of branch waste above floor.

All of the cleanouts have a very definite purpose in providing access to the overall piping system.

Waste Line Above Floor

Now disregard the numerals shown in Fig. 1, for the first type of cleanout to be discussed is the one that is installed to protect a horizontal waste branch installed above the floor. An example is given in Fig. 2.

Here, a battery of three water closets and four lavatories is involved; the cleanout is installed at the end of the waste branch as shown. The water closets are the wall mounted type and thus permit the horizontal waste branch to be installed above the floor.

Many different objects, such as paper, cloth and bars of soap are often discharged through the water closet and can cause stoppages in the waste line. Once in the drainage line, these objects or materials will block the line and will cause overflow at the fixtures. A reduced diameter branch has been used as the waste line from the lavatories. If desired, this line can also be of the same diameter as the line for the water closets. Factors that cause stoppages in lavatory waste lines are hair, hair pins and grease deposits that may be due to soap.

In this instance, piping is of the threaded type. The cleanout consists of a drainage elbow and an extension cleanout with a wall plate covering an access to the cleanout plug.

In clearing a stoppage, the cleanout plug is removed

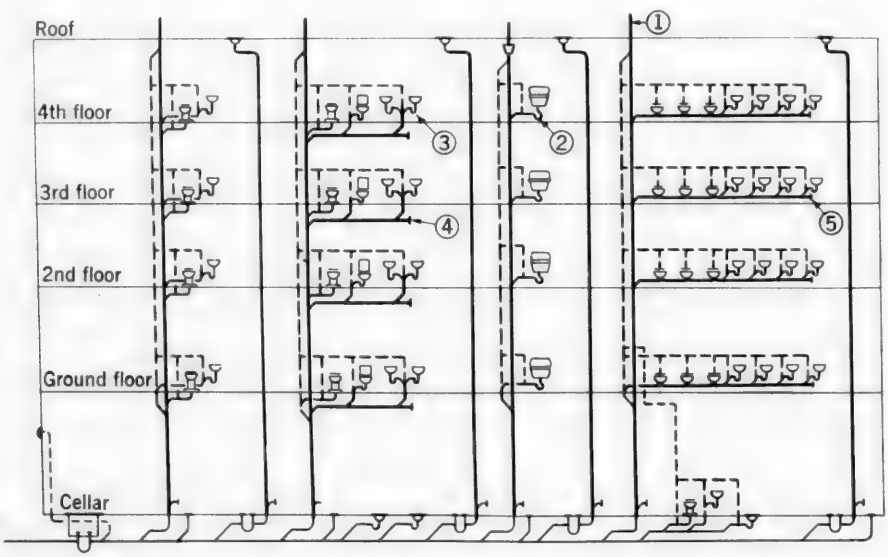


Fig. 1. Typical plumbing riser diagram.

and a wire snake inserted in the line to snag and pull out the foreign object or to push it into the vertical line. The snake will also dislodge grease deposits. Since the means of access to the cleanout plug is exposed in the room, it is important that a device is selected that will harmonize with the architectural treatment of the room. There are many type units available.

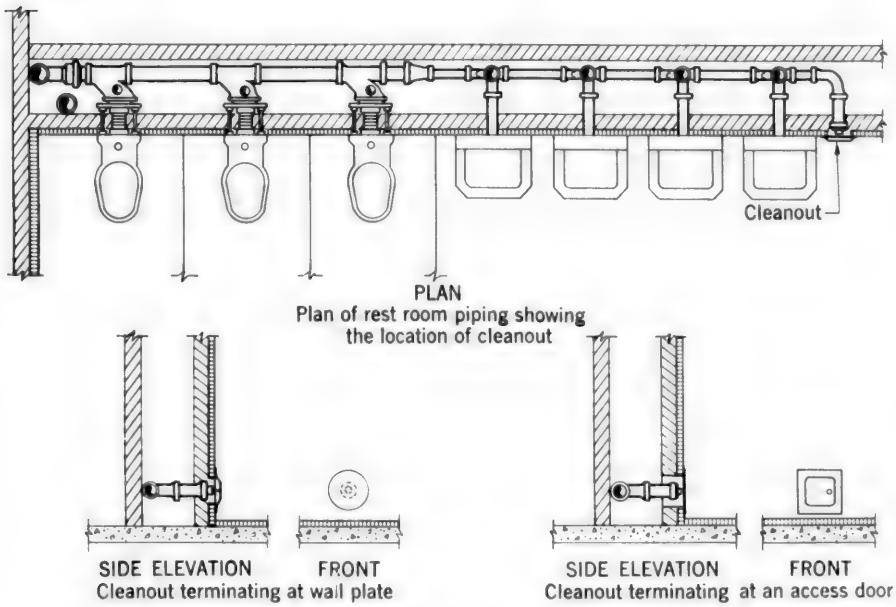


Fig. 2. How a cleanout may be installed on piping located above the floor slab.

Waste Line Below Floor

Figure 3 gives an example of how a cleanout may serve a waste installed below the floor slab. Here, the installation consists of a floor mounted water closet, a urinal and three lavatories. The cleanout is shown as being extended above the floor level and terminates at an access door set in the wall. This cleanout could just as easily be placed at the end of the branch under the floor, with its termination at the wall of the floor below. However, this method is not too practical, for in the event of a stoppage, the waste line will be filled with water, and this accumulation of waste water will discharge when the cleanout plug mounted on the wall of the floor below is removed.

There is less possibility of this occurrence when the cleanout plug is elevated above the horizontal waste line. In the event of a stoppage, the cleanout plug is removed and a wire snake inserted to clear the matter that is blocking the line.

The elevations included in Fig. 3 show how both a wall plate and an access door can be used to provide the means of entry to the cleanout plug. The piping arrangement is for example only; other favored arrangements can be used with equal success.

Vertical Stacks

Sometime, stoppages occur in vertical stacks and must be cleared to prevent overflow at fixtures above the point of stoppage. Figure 4 shows a vertical stack and the locations where cleanouts provide access for clearing the stoppages. The typical riser diagram indicates the arrangement of the stack used for the example shown. Note the stack terminal at the roof, and the base of stack cleanout at the lowest floor level.

A stoppage in the vertical stack can be difficult to clear since large foreign objects or pieces of matter are involved. The objects may be sticks that are dropped in the stack by children at the roof level opening. These objects may lodge in the line or may drop to the bottom of the stack. If they are lodged in the line, it becomes necessary to insert a wire snake in the stack at roof level and attempt to snare or dislodge the object. If the object is dislodged, it will drop to the base of the stack where

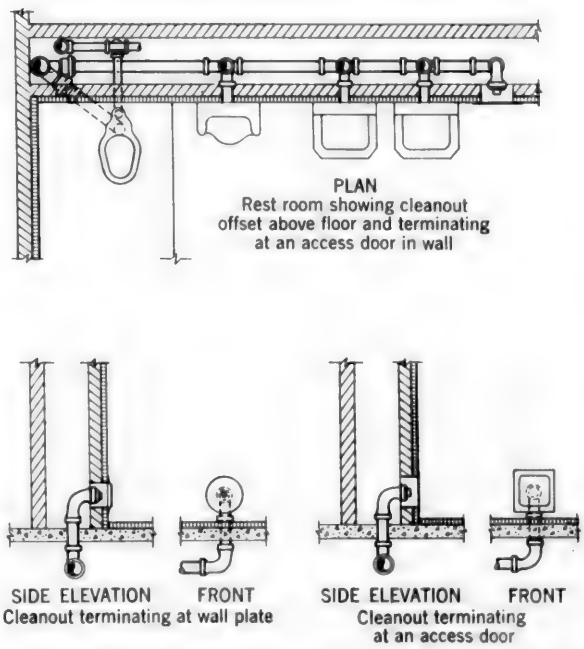

PLAN
Rest room showing cleanout offset above floor and terminating at an access door in wall
SIDE ELEVATION
FRONT
Cleanout terminating at wall plate
SIDE ELEVATION
FRONT
Cleanout terminating at an access door

Fig. 3. How a cleanout may be installed on piping located below the floor slab.

it can be handled by the cleanout at this location. Sometimes, a weighted ball at the end of a stout cord is inserted in the stack and manipulated to dislodge an object.

Since most objects or matter generally drop to the base of the stack, the base of stack cleanout is most useful in clearing the stoppage at this point. The base of stack cleanout consists of a cleanout tee, plug and a wall access opening which is covered by either a wall plate or an access door. Note that the wall plate is held in place by a threaded rod which engages the cleanout plug.

Fixtures

Most plumbing fixtures are equipped with a cleanout plug. Figure 5 shows two plumbing fixtures and indicates their means for cleanout.

Service sinks are supported on P-trap standards which are equipped with a cleanout plug as shown. When the plug is removed access is gained to the trap and the horizontal waste line to its point of connection with the vertical stack. Stoppages that occur in the waste piping between the fixture and the vertical stack are easily cleared with a wire snake.

Water closets, by nature of their construction are equipped with an internal trap where foreign objects discharged in the bowl will cause stoppages. There are devices especially constructed for clearing such stoppages. Often a rubber plunger is very helpful in dislodging the object.

All other fixtures that are prone to stoppages are provided with a cleanout plug to offer access to the waste line.

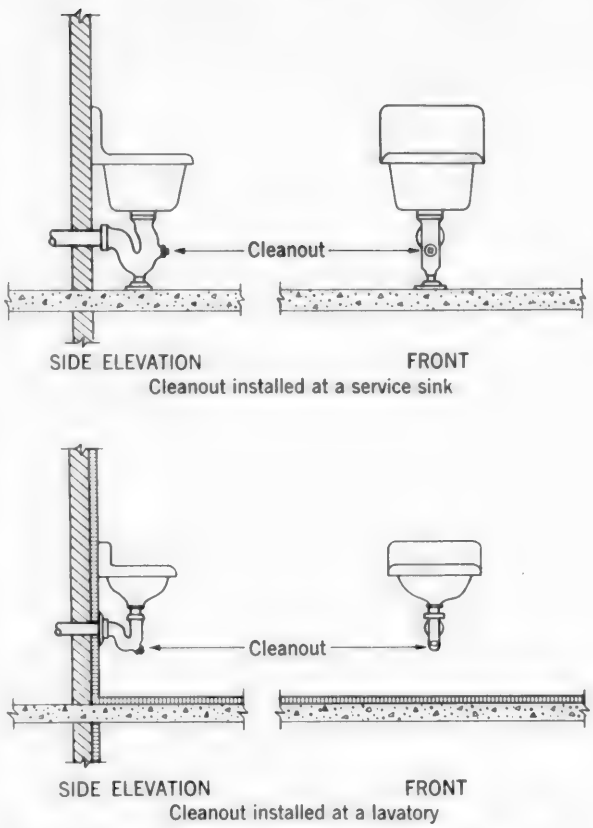


Fig. 5. Cleanouts installed at fixtures to keep waste lines clear of stoppages.

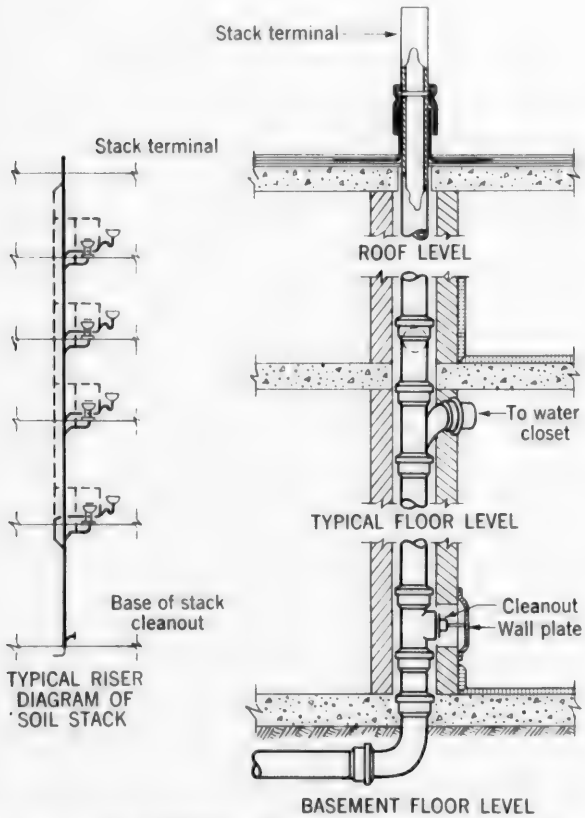


Fig. 4. How cleanout access may be provided for a vertical soil or waste stack.

Types of Access Devices

There are numerous devices that may be used for cleanout and access purposes. Several of these are shown in Fig. 6.

Type 1 is a cleanout tee installed in a vertical soil, waste or leader line to offer access to the line in the event of a stoppage. It is a caulked fitting with a threaded outlet into which a cleanout plug is placed. The cleanout plug may be of brass, cast iron or other approved material. This arrangement will serve as shown for exposed piping but when the piping is concealed, a wall access opening must be provided, and a wall plate or other means incorporated in the wall to facilitate access to the cleanout plug.

Type 2 is a threaded cleanout tee with a threaded outlet to receive the cleanout plug. Several types of tees are available. If a copper drainage system is used, there are copper cleanout tees available.

Type 3 is a caulked cleanout tee. It is equipped with a caulked outlet into which a ferrule is caulked. The ferrule is tapped to receive the cleanout plug. Lead seal type cleanout plugs may also be used with this combination. However, the lead seal plug and ferrule must be ordered as a unit. In addition, there are several types of extensions that may be used with this cleanout tee to satisfy the specific needs of the installation. Some means of wall access must be provided.

Four of the devices that can be used for ease of access to the concealed cleanout plugs are shown in Fig. 6.

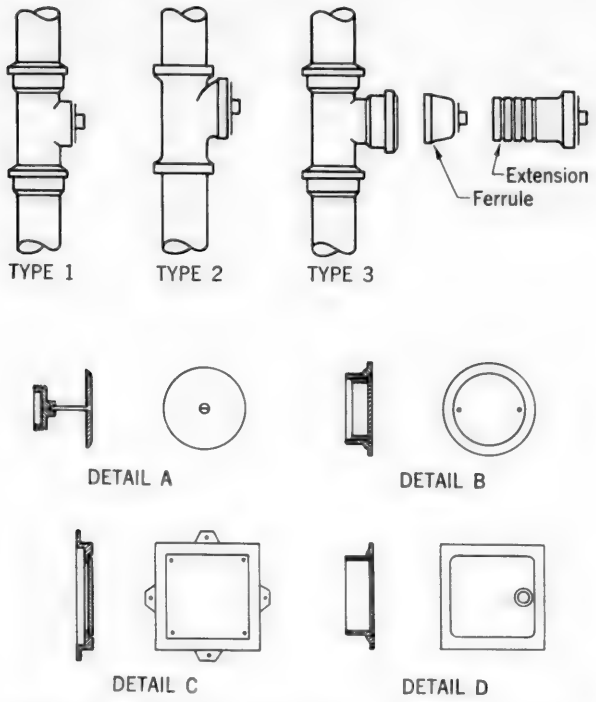


Fig. 6. Various devices that may be used for cleanout purposes.

Detail *A* is a wall plate that can be furnished in chrome plated brass, nickel bronze, stainless steel or other desired materials to satisfy the decorative wall finish desired. The wall plate is secured in place by means of the threaded rod that engages the cleanout plug. There are a number of different sizes and shapes of wall plates available to offer a broad selection.

Detail *B* consists of a frame that is anchored to the wall construction. The cover plate is threaded and is removed with a spanner wrench. This offers some vandal proof protection. The unit is generally constructed of chrome plated brass or nickel bronze. Different sizes and shapes are available to satisfy any specific need.

Detail *C* shows a square access frame and cover. The frame is anchored to the wall construction and the cover is secured with four screws. Here again, several different sizes and shapes and materials are available. When required, vandal proof screws can be provided.

Detail *D* illustrates access cover and frame, a very popular means for permitting entry to the cleanout plug. The unit consists of a frame and hinged cover. The frame is anchored to the wall construction and the door is opened by either a screw driver latch or a lock and key. When this unit is equipped with a cylinder lock, it insures a tamper-proof means of access. Once again, several different sizes and shapes are available, constructed of steel, stainless steel or brass. They can be finished to any degree of lustre or color to harmonize with the wall finish.

The access box Detail *D* is also very suitable for installation in ceilings to offer access to cleanout plugs placed at the end of run or at offsets in piping that is installed in furred ceiling spaces. In this instance it is advisable to select a unit with a snug fitting cover and thus prevent plaster or construction grit from passing through cover voids and settling on the floor or a room or corridor below.

When designing a layout for soil, waste and leader lines, remember that access must be provided for every portion of the piping system to clear any stoppages that may occur. The faster a stoppage can be cleared, the less danger there is from overflow damage. Be generous in locating cleanouts. They certainly are an asset.

New Air Heating System Points Up Old Problems

The application of the newest form of supplying heat through a ducted air distribution system—electricity—re-emphasizes problems which were first called to the industry's attention more than 10 years ago. The first and most obvious of these problems, is the need for adequate insulation carefully placed in walls and ceilings of the house, in the floors of rooms over unheated areas, and at the perimeter of slabs and crawl spaces.

The second and equally important problem which is encountered is that of protecting against excessive moisture in and under the structure. Hence, from the standpoints of occupant comfort, preventing structural deterioration and excessive operating cost, moisture control is of extreme importance in any home regardless of the type of system installed or fuel used.

In a recent investigation of some electrically-heated homes in the midwestern part of the United States, the staff of National Warm Air Heating and Air Conditioning Association found that electric heating emphasized all of these problems. The basic complaint of the home owners was operating cost. Thorough investigations showed, however, that improper or ineffectively placed insulation and excessive moisture were the reasons why the operating costs were above those estimated before the systems were installed. It is true that an increase in operating cost would have been experienced if other fuels had been used since the causes were constructional in nature rather than being directly attributable to the heating system.

This situation again indicates the importance of good construction and protection from moisture as shown in the Association's Manual 4. The following steps must be followed for both crawl space and slab construction: 1. The exterior finish grade must be such that drainage is away from the house, rather than toward it. 2. Effective vapor barriers must be used together with proper coarse fill installed under the vapor barrier. 3. Footing drains should be used if there is any reason to suspect that either surface or ground water will find its way into the crawl space or underneath the slab. 4. Perimeter insulation must be used and it should be the type of insulation which will withstand the effects of water and humidity.

APPLICATIONS AND INSTALLATIONS

Corporate Dynamism Required Flexible Air Distribution System

THE construction details of the tallest building with stainless steel "curtain walls" and the corporate growth of its owner combined to present design engineers with some very specialized air conditioning requirement, including complete flexibility of air distribution. Besides solving the air distribution problem in a unique manner, engineers came up with some other interesting techniques for this building, including year-round supply of chilled water to off-the-floor perimeter induction units, dual duct conditioning in the interior zones, and evaluation of equipment and materials in building "mock-ups."

Refrigeration Plant

The new home of Union Carbide Corporation in New York City consists of a 52-story tower on the Park Avenue side connected to a 12-story section on the Madison Avenue side, providing a total of 1,500,000 sq ft of space and a useable area of 1,150,000 sq ft. The gross air conditioning tonnage is 5000 tons and the electrical load anticipated is 15,000 KVA.

For the refrigeration plant, 14 different schemes were analyzed, according to Arnold L. Windman, project engineer on this job for Syska and Hennessy, mechanical and electrical consultants. The system chosen consisted of two 1000-ton steam turbine machines in the Tower, serving from the 23rd floor up, and three 1000-ton steam turbine machines in the cellar, serving the remainder of the building. Although this plan cost initially slightly more than the next most attractive scheme (two 1000-ton steam-driven units in the Tower and two 1500-ton steam-driven units in the cellar), it was recommended and installed since:

1. Spare parts could be more easily stocked since all units were the same,
2. Operating personnel could easily be interchanged between machinery rooms since the equipment in both would be identical, and
3. The loss of one machine in the lower portion of the building would represent only ⅓ of the total capacity for the area served, instead of ½ as under the other plan, resulting in greater reliability of service.

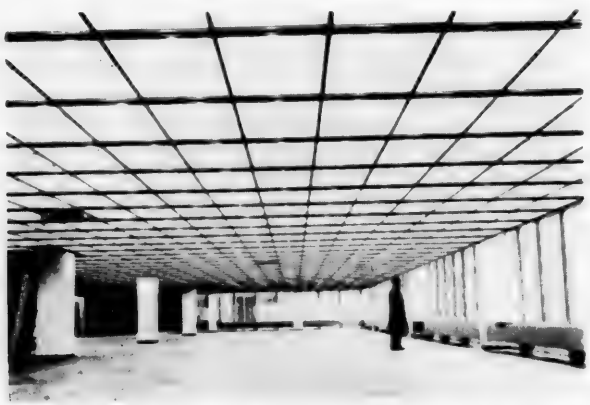


Fig. 1. Ceiling system in new Union Carbide building provides illumination, distributes conditioned air, provides top anchor for movable partitions, and blocks sound from traveling through ceiling cavity.

Air Conditioning

For the perimeter offices, an analysis was made between the use of dual duct and primary air induction type air conditioning. A primary air system for this building proved more economical, required considerably less vertical duct shaft space, and was the selected scheme. Due to the size of the exterior columns, vertical distribution of air and water to the primary air units was not feasible. These services, therefore, are fed to the units from horizontal distribution systems in the ceiling of each floor below. The units themselves, as shown in Fig. 1, are suspended in an enclosure between the columns. This results in a pleasing architectural effect since light may enter the room below the air conditioners.

Due to the large glass areas, an analysis indicated that the changeover point from cold water to hot water in the primary air system would occur when the outdoor temperature was well below freezing. This, of course, would require winterization of several cells of the cooling tower. When this fact had been established, it was further determined that it would be most economical if no changeover were required on the system at any time. In other words, the system is arranged so that chilled water is furnished to the window induction units on a year-round basis. The primary air temperature is gradually varied from about 56 deg F in the summer to about 140 to 150 deg in the winter. Control is obtained by furnishing more or less chilled water to the units summer and winter.

Thus control valves may operate in the same manner summer and winter; the operator at no time need worry as to which cycle is required on any zone. Furthermore, where at one time both the air and the water were provided with individual zones for the four building exposures, the final design permits the installation of a single water zone for the entire building at a substantial cost saving. Mr. Windman emphasizes that this arrangement proved economical for this building only after winterization of the cooling tower was deemed necessary by the large glass surfaces.

The induction units are provided with one thermostat for each two units, thus assuring that each office will contain a unit controlled from within that office.

For the interior areas, a dual duct system was selected with approximately five zone mixing boxes on each floor. The warm and cold air are distributed from the fan rooms through vertical shafts under high pressure at

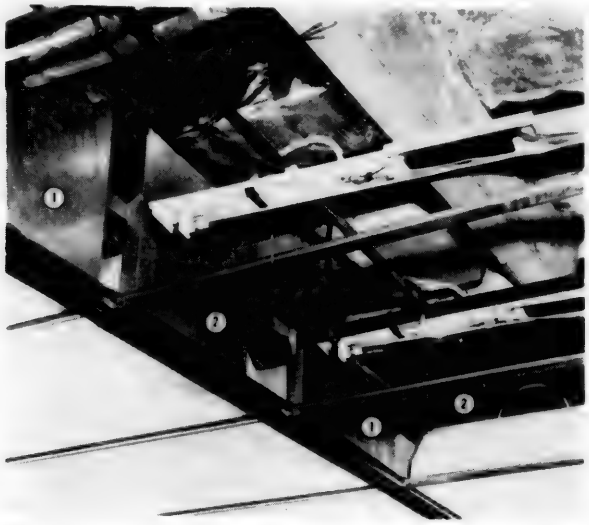


Fig. 2. Open view of ceiling system shows runners, and supply and exhaust "boots."

high velocities. From each mixing box to the air outlets, a low pressure duct distribution system is employed.

Air Distribution

The owner's requirement, based on anticipated and unanticipated growth, was that all partitions were to be capable of being taken down and re-erected without disturbing either the air conditioning ducts or diffusers or the lighting fixtures, and without the necessity of any access whatsoever into the suspended ceiling. He further required that these partitions could be relocated at any point every 2½ ft in a north-south direction and every 5 ft in an east-west direction.

The ceiling system developed to accommodate the owner's flexibility requirements consists, as shown in Fig. 1, of a continuous plane of lighting fixtures with a series of specially-fabricated stainless steel runners installed as spacers between the fixtures. The fixtures are 2½ ft by 5 ft with a single 40-watt fluorescent lamp.

The major runners, shown in Fig. 2 going from left to bottom of photo, act as both partition supports and air diffusers. They are slotted on one side and contoured on both sides to distribute the conditioned air and to return the used air. Small ducts labeled "2," in Fig. 2, are supply "boots" and are connected by round pipe to low pressure distribution duct. These round supply connections contain a remote-operated umbrella type damper should it become necessary to readjust air quantities. Small ducts labeled "1" are exhaust "boots" and are connected by round pipe to return air system. Partitions fit into slot in the bottom of runners without disturbing the air flow.

Building Mock-Ups

Many different combinations of luminous ceilings, light fixtures and runners were designed and erected before the ultimate building installation. The use of full-size mock-ups in connection with this work was of the utmost importance. The mock-ups permitted evaluation of the overall appearance of the ceilings under consideration, tests of the air handling properties of the runner, and measurements of the lighting levels developed by each fixture scheme. In addition, the owner performed time and motion study tests to determine the cost of fluorescent lamp replacements and cleaning of fixtures.

Mock-ups also served as a full-size test of the glass, floor coverings, furniture, curtain wall, and the sidewalk and plaza paving. According to Mr. Windman, the mock-up technique paid for itself many times over in resultant job savings.

Flexible Hose Fuel and Steam Connections Improved Boiler Efficiency

Positive, long-life connections that ensure optimum efficiency of operation are achieved in a new steam boiler through use of Springfield "140" Teflon and stainless steel industrial hose assemblies. This new application of Springfield "140" was first employed by Wickes Boiler Co., Saginaw, Mich., on a 50,000 lb per hr model of a new line of compact, high efficiency boilers for commercial, industrial and apartment installations.

In designing their oil-fired unit, Wickes engineers sought an easily installed method of tying in oil and steam lines to use in place of convoluted metal hose. This previous technique had proven unsatisfactory since it allowed a significant loss in heat and pressure in these lines, and was subject to corrosion from steam. Pressure drop in the fuel line was particularly detrimental since it led to condensation which inhibited oil atomization in the burner.

Informed of the problem, Harry Loss, of Loss Sales Co., Flint, Mich., consulted the local representative of Titeflex, Inc., Springfield, Mass., on the right way to meet this new application. Springfield "140" hose was suggested for a variety of reasons. Its innercore of Du Pont Teflon—a fluorocarbon resin—was particularly suitable since its uniformly smooth, slippery surface ensured optimum flow. Teflon's corrosion resistance and heat-stability at temperatures as high as 450 deg met the oil and steam-handling requirements of the job.

DEGREE-DAYS FOR JANUARY, 1960

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 32nd Year of Publication of Monthly Degree-Day Data

City	January			Season to Jan. 31, incl., from Sept. 1		
	1960	1959	Normal	1959-60	1958-59	Normal
Abilene, Texas (A)	639	689	673	1803	1837	1771
Albany, New York (A)	1307	1354	1318	3742	4155	3877
Albuquerque, New Mexico (A)	987	948	970	2712	2516	2727
Alpena, Michigan (C)	1366	1509	1358	4433	4412	4185
Anchorage, Alaska (A)	1482	1700	1612	5685	6234	5889
Asheville, North Carolina (C)	800	867	794	2353	2509	2427
Atlanta, Georgia (A)	635	711	632	1735	1777	1757
Atlantic City, New Jersey (C)	865	1034*	905	2418	3039*	2502
Augusta, Georgia (A)	588	611	521	1534	1652	1356
Baltimore, Maryland (C)	841	927	880	2303	2628	2417
Billings, Montana (A)	1291	1297	1305	4058	3827	4044
Binghamton, New York (C)	1067	1280	1218	3119	3976	3635
Birmingham, Alabama (A)	622	696	623	1674	1833	1751
Bismarck, North Dakota (A)	1668	1914	1730	5143	5321	5188
Block Island, Rhode Island (A)	983	1050	1026	2748	3110	2962
Boise, Idaho (A)	1268	896	1169	3991	2943	3509
Boston, Massachusetts (A)	1048	1118	1113	2942	3325	3121
Buffalo, New York (A)	1188	1317	1225	3475	3842	3649
Burlington, Iowa (A)	1203	1471	1271	3609	3794	3605
Burlington, Vermont (A)	1497	1479	1460	4288	2626	4319
Cairo, Illinois (C)	820	945	856	2362	2488	2321
Charleston, South Carolina (C)	460	526	445	1147	1208	1103
Charlotte, North Carolina (A)	691	741	704	1896	2035	1978
Chattanooga, Tennessee (A)	709	829	725	2046	2233	2105
Cheyenne, Wyoming (A)	1214	1194	1225	4114	3765	4065
Chicago, Illinois (A)	1137	1437	1243	3442	3733	3595
Cincinnati, Ohio (C)	846	1013	942	2520	2787	2653
Cleveland, Ohio (A)	1039	1261	1132	3128	3559	3303
Columbia, Missouri (A)	1033	1246	1091	3047	3099	3058
Columbia, South Carolina (A)	603	630	538	1602	1732	1446
Columbus, Ohio (C)	960	1178	1051	2905	3387	3046
Concord, New Hampshire (A)	1287	1353	1392	3834	4349	4231
Concordia, Kansas (C)	1243	1278	1144	3385	3216	3192
Dallas, Texas (A)	628	664	607	1584	1601	1477
Denver, Colorado (A)	1151	1081	1125	3551	3151	3473
Des Moines, Iowa (A)	1352	1503	1330	3945	3872	3785
Detroit, Michigan (A)	1110	1349	1203	3388	3740	3528
Devils Lake, North Dakota (C)	1903	2050	1866	5839	5816	5661
Dodge City, Kansas (A)	1112	1189	1076	3169	3103	3027
Dubuque, Iowa (A)	1376	1631	1414	4267	4405	4179
Duluth, Minnesota (A)	1686	1937**	1696**	5444	5697**	5229**
Elkins, West Virginia (A)	(a)	1126	1017	(a)	3586	3272
El Paso, Texas (A)	691	523	670	1736	1451	1756
Ely, Nevada (A)	1418	1115	1302	4454	3736	1302
Escanaba, Michigan (C)	1371	1662	1473	4420	4730	4529
Evansville, Indiana (A)	874	1048	939	2689	2975	2654
Fairbanks, Alaska (A)	2134	2643	2319	8100	9006	8248
Fargo, North Dakota (A)	1762	1903	1795	5268	5309	5333
Fort Smith, Arkansas (A)	785	864	775	2121	2205	2048
Fort Wayne, Indiana (A)	1128	1353	1200	3449	3859	3565
Fort Worth, Texas (A)	643	690	622	1631	1678	1512
Fresno, California (A)	556	488	629	1479	1294	1640
Galveston, Texas (C)	384	418	356	895	894	758
Grand Junction, Colorado (A)	1183	1096	1271	3515	3061	3564
Grand Rapids, Michigan (A)	1175	1462	1287	3700	4082	3879
Green Bay, Wisconsin (A)	1359	1741	1516	4489	4771	4551
Greensboro, North Carolina (A)	776	860	806	2284	2470	2319
Greenville, South Carolina (A)	680	723	673	1917	1909	1873
Harrisburg, Pennsylvania (A)	961	1095	1051	2878	3266	3022
Hartford, Connecticut (A)	1163	1186	1178	3346	3729	3444
Havre, Montana (C)	1512	1686	1513	4660	4753	4753
Helena, Montana (A)	1522	1367	1469	4856	4462	4716
Houston, Texas (C)	404	426	378	973	974	843
Huron, South Dakota (A)	1634	1738	1597	4777	4676	4600
Indianapolis, Indiana (A)	1020	1239	1122	3218	3531	3263
Jackson, Mississippi (A)	606	663	535	1585	1654	1417
Juneau, Alaska (A)	1146	1449	1203	4148	4710	4515
Kansas City, Missouri (A)	1049	1187	1085	2914	2859	2960
Knoxville, Tennessee (A)	742	854	760	2133	2286	2214
La Crosse, Wisconsin (A)	1349	1694	1528	4288	4494	4428
Lander, Wyoming (A)	1450	1373	1494	4720	4235	4803
Lewiston, Maine (O)	1259	1343	1452	3818	4366	4289

a) Data not available.
* Figures based on Airport readings.
** Figures based on City office readings.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Co., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively.

Degree-Days for January, 1960 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 32nd Year of Publication of Monthly Degree-Day Data

City	January			Season to Jan. 31, incl., from Sept. 1		
	1960	1959	Normal	1959-60	1958-59	Normal
Lincoln, Nebraska (C)	1344	1331	1240	3670	3372	3483
Little Rock, Arkansas (A)	733	776	719	1944	1970	1898
Los Angeles, California (C)	319	155	328	489	369	779
Louisville, Kentucky (A)	830	1001	933	2495	2785	2666
Lynchburg, Virginia (A)	837	891	846	2423	2599	2471
Macon, Georgia (A)	528	565	497	1409	1406	1321
Madison, Wisconsin (A)	1355	1684	1417	4233	4505	4124
Marquette, Michigan (C)	1349	1617	1435	4477	4612	4446
Memphis, Tennessee (A)	715	780	725	1975	2069	1973
Meridian, Mississippi (A)	611	750	561	1616	1744	1517
Milwaukee, Wisconsin (A)	1259	1594	1336	3963	4272	3947
Minneapolis, Minnesota (A)	1467	1686	1562	4507	4554	4552
Moline, Illinois (A)	1212	1523	1296	3707	3909	3722
Montgomery, Alabama (A)	541	573	517	1414	1416	1381
Nashville, Tennessee (A)	769	861	778	2200	2370	2150
New Haven, Connecticut (A)	1048	1124	1113	2999	3403	3258
New Orleans, Louisiana (C)	390	421	341	912	898	770
New York, New York (C)	941	1031	995	2625	2931	2766
Newark, New Jersey (A)	940	1036	1039	2622	3019	2951
Norfolk, Virginia (A)	713	777	729	1901	2053	1986
North Platte, Nebraska (A)	1400	1292	1271	4226	3851	3835
Oak Ridge, Tennessee (C)	764	894	834	2171	2433	2421
Oakland, California (A)	497	415	552	1304	1127	1629
Oklahoma City, Oklahoma (A)	880	983	843	2394	2444	2210
Omaha, Nebraska (A)	1370	1431	1302	3789	3617	3670
Parkersburg, West Virginia (C)	880	1078	949	2695	3106	2773
Peoria, Illinois (A)	1171	1435	1240	3542	3729	3552
Philadelphia, Pennsylvania (C)	868	963	933	2414	2814	2557
Phoenix, Arizona (A)	506	341	425	993	740	980
Pittsburgh, Pennsylvania (C)	910	1116	992	2719	3211	2882
Pittsfield, Massachusetts (A)	1318	1381	1358	3951	4396	4203
Pocatello, Idaho (A)	(a)	1106	1333	(a)	3505	4060
Portland, Maine (A)	1273	1349	1373	3852	4379	4149
Portland, Oregon (C)	853	677	791	2435	2016	2391
Providence, Rhode Island (A)	1106	1134	1125	3147	3478	3320
Pueblo, Colorado (A)	1282	1143	1104	3595	3131	3383
Raleigh, North Carolina (A)	721	786	691	2073	2246	1857
Rapid City, South Dakota (A)	1266	1374	1361	4212	3907	4163
Reading, Pennsylvania (C)	932	1045	1017	2714	3115	2883
Red Bluff, California (A)	645	507	617	1444	1185	1559
Reno, Nevada (A)	1156	875	1048	3637	3028	3386
Richmond, Virginia (A)	807	847	828	2308	2465	2360
Rochester, New York (A)	1244	1326	1249	3635	3938	3722
Roswell, New Mexico (A)	848	789	787	2338	2268	2202
Sacramento, California (C)	542	451	614	1470	1107	1594
St. Joseph, Missouri (A)	1169	1339	1017	3244	3326	2826
St. Louis, Missouri (C)	940	1146	983	2695	2838	2686
Salt Lake City, Utah (A)	1212	956	1194	3760	3037	3473
San Antonio, Texas (A)	465	497	462	1202	1194	1062
San Diego, California (A)	309	156	317	493	358	795
Sandusky, Ohio (C)	1085	1283	1122	3193	3586	3238
San Francisco, California (C)	425	333	462	1024	913	1343
Sault Ste. Marie, Michigan (A)	1444	1665	1587	4757	5082	4927
Savannah, Georgia (A)	473	537	424	1227	1282	1099
Scranton, Pennsylvania (A)	1109	1243	1141	3397	3890	3395
Seattle, Washington (C)	701	684	753	2397	2168	2435
Sheridan, Wyoming (A)	1320	1397	1392	4507	4240	4437
Shreveport, Louisiana (A)	598	609	550	1563	1576	1398
Sioux City, Iowa (A)	1464	1539	1423	4206	4051	4131
Spokane, Washington (A)	1374	1111	1243	4376	3661	3348
Springfield, Illinois (A)	1082	1309	1116	3203	3433	3114
Springfield, Missouri (A)	932	1094	1001	2811	2867	2834
Syracuse, New York (A)	1241	1357	1225	3580	4032	3565
Toledo, Ohio (A)	1113	1359	1197	3563	3878	3561
Topeka, Kansas (C)	1136	1265	1088	3242	3189	2979
Trenton, New Jersey (C)	932	1027	1004	2669	3055	2856
Tulsa, Oklahoma (A)	(a)	960	856	(a)	2322	2238
Utica, New York (O)	1172	1361	1248	3336	4127	3785
Valentine, Nebraska (A)	1347	1409	1361	4398	4115	4070
Walla Walla, Washington (C)	1171	855	1023	3303	2689	2989
Washington, D. C. (A)	824	923**	884**	2319	2592**	2488**
Wichita, Kansas (A)	1050	1187	1023	2886	2902	2786
Williston, North Dakota (C)	1695	1839	1705	5197	5195	5200
Winnemucca, Nevada (A)	1238	936	1153	4076	3276	3748
Yakima, Washington (A)	1318	1047	1181	3871	3476	3650

For footnotes, see page 98.

NEW LITERATURE

Use the prepaid postcard on last page for securing your copies of these catalogs.

Air-Cooled Condensers

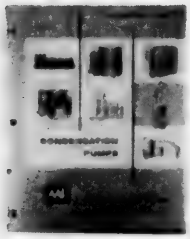
Halstead & Mitchell, Pittsburgh, Pa., announces a 12-page catalog, AC-102, which presents a thorough analysis of its air-cooled condensers from the twin standpoints of "specification" and "application." Covers horizontal air flow, vertical air flow, centrifugal fan and residential types.

Circle **Item 1** on Inquiry Card

Baseboard Convectors

Young Radiator Co., Racine, Wis., announces a revised Perimaheat baseboard convector catalog. This 12-page catalog, No. 4360, presents complete data on hydronic baseboard convector units, including design features, capacity data, specifications, and detailed installation instructions.

Circle **Item 2** on Inquiry Card



Condensation Pumps

A 12-page product bulletin covering its Illinois condensation pump line is offered by American Air Filter Co., Inc., Louisville, Ky. Illustrating and describing six basic condensation pumps, Bulletin CP-600 includes design features, general specifications, engineering and selection data.

Circle **Item 3** on Inquiry Card

Pre-Jacketed Pipe Insulation

Pre-jacketed pipe insulation, called Metal-On, is described in a 4-page bulletin offered by Johns-Manville, New York, N. Y. Insulation consists of high temperature Thermobestos, factory jacketed in weather-proof alumimum. Bulletin describes the snap-around installation procedure.

Circle **Item 4** on Inquiry Card

Packaged Boilers

Cleaver-Brooks Co., of Milwaukee, Wis., announces two 8-page bulletins giving specifications, ratings and dimensions of C-B packaged boilers. One covers use of these boilers for heating or processing; the other, boilers and high temperature equipment for heating and process loads.

Circle **Item 5** on Inquiry Card

Industrial Hose and Fittings

Industrial Catalog No. 204, containing descriptive information about Aeroquip hose, fittings, self-sealing couplings and related products, is announced by Aeroquip Corp., Jackson, Mich. The 40-page catalog features products for use on general industrial applications.

Circle **Item 6** on Inquiry Card

Check Valves

Details and specifications for its complete line of check valves are given in a 20-page bulletin published by Combination Pump Valve Co., Philadelphia, Pa. Bulletin 600 includes a technical discussion on how CPV check valves eliminate water hammer and line surge.

Circle **Item 7** on Inquiry Card

Mercury Switch Equipped Controls

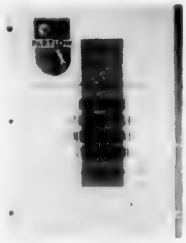
In 56 informative pages, Catalog No. 800, from The Mercoid Corp., Chicago, Ill., lists mercury switch equipped controls for pressure, temperature, liquid level and mechanical movement. Dual index facilitates finding description, specs and engineering data for each control.

Circle **Item 8** on Inquiry Card

Industrial Dryers and Ovens

Industrial dryers and ovens from J. O. Ross Engineering, Div. of Midland-Ross Corp., New York, N. Y., are described in Bulletin ID-300. The 4-page bulletin illustrates typical installations for paint baking; heat treating; rubber, plastics and ceramic curing; and other similar applications.

Circle **Item 9** on Inquiry Card



Temperature Measurement and Control

Directed toward the design and process engineer, a 24-page guide to industrial temperature measurement and control is offered by The Partlow Corp., New Hartford, N. Y. It describes basic concepts of electrical, pneumatic and mechanical control, and includes circuit diagrams.

Circle **Item 10** on Inquiry Card

Filtration Plant Valves

Filter drain valves, backwash valves, and rewash valves, specifically designed for filtration plant functions, are described in an 8-page bulletin offered by Golden-Anderson Valve Specialty Co., Pittsburgh, Pa. Bulletin W-18 provides installation and operating data, dimensions and specs.

Circle **Item 11** on Inquiry Card

Pump, Air Compressor Switches

Penn Controls, Inc., Goshen, Ind., announces a 20-page condensed catalog of switches for the pump and air compressor industries. Bulletin 1534-Y illustrates and describes these switches, and gives specifications, application data, and procedure for ordering any of the devices.

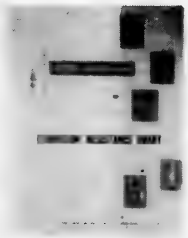
Circle **Item 12** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.

Steam Trap Sizer

An 8-page technical bulletin from The Clark Manufacturing Co., Cleveland, Ohio, simplifies steam trap sizing and selection for various applications. Direct-reading charts make it possible to pinpoint the right steam trap easily, quickly and accurately. Lengthy computations are eliminated.

Circle **Item 13** on Inquiry Card



Corrosion Resistance Chart

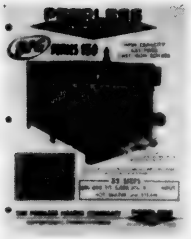
A 4-page corrosion resistance chart, J-CRC, is available from OPW-Jordan Corp., Cincinnati, Ohio. It lists over 150 different chemicals and their recommended usage with ductile iron, iron, steel, 316 and 304 stainless steel, monel, brass, bronze, copper, aluminum and plastisol plastics.

Circle **Item 14** on Inquiry Card

Gas-Fired Unit Ventilator

A 16-page bulletin describing the Herman Nelson UNIvent gas-fired unit ventilator for use in school classrooms is offered by American Air Filter Co., Inc., Louisville, Ky. Bulletin No. 685-A1 contains construction features, engineering data, operation and controls information, and specs.

Circle **Item 15** on Inquiry Card



Industrial Cast Iron Boilers

The Peerless Heater Co., Boyertown, Pa., announces an 8-page catalog on its Series 150 industrial cast iron boilers. Literature covers the full line consisting of 33 sizes with ratings from 600,000 to 5,400,000 Btu per hr input for hot water and steam heating systems.

Circle **Item 16** on Inquiry Card

Copper Tube and Pipe

Bridgeport Brass Co., Bridgeport, Conn., now offers expanded distribution of its quality line of copper water tube, DWV copper drainage tube, copper refrigeration tube, brass and copper pipe, and plumbing brass goods. An 8-page catalog shows types, sizes, weights, flow data.

Circle **Item 17** on Inquiry Card

Humidity Measurement and Control

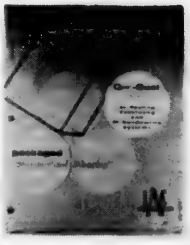
Both typical and tailored humidity measurement and control systems are described in 68-page Catalog 660, published by Hygrodynamics, Inc., Silver Spring, Md. Other sections of catalog contain general information and product data on indicators, recorders, controllers and charts.

Circle **Item 18** on Inquiry Card

Evaporative Water Coolers

Unit selection charts and tables for blow-through type evaporative water coolers are contained in 8-page bulletin offered by manufacturer, Drayer-Hanson Div., National-U. S. Radiator Corp., Los Angeles, Calif. Thirteen models are listed, with capacities ranging from 5 to 110 tons.

Circle **Item 19** on Inquiry Card



Duct Silencers

A 12-page catalog describing the company's Quiet-DUCT silencers, including technical data on the design and application of packaged unit silencers for air conditioning and ventilating systems, is available from Air Conditioning Dept., Industrial Acoustics Co., Inc., New York, N. Y.

Circle **Item 20** on Inquiry Card

Boiler-Burner Units

Series D boiler-burner units from Aldrich Co., Wyoming, Ill., perform efficiently for hot water or steam heating and hot water supply. Descriptive bulletin gives details of these units, including performance data (ratings and specifications) and dimensions keyed to diagrams.

Circle **Item 21** on Inquiry Card

Thermostatic Tempering Valves

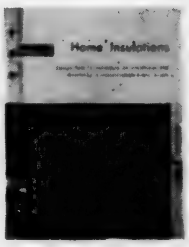
Lawler Automatic Controls, Inc., Mt. Vernon, N. Y., offers a 2-page bulletin describing its complete line of TV-44 thermostatic tempering valves. Installation diagrams show how valves are suitable for controlling domestic hot water systems in addition to panel heating systems.

Circle **Item 22** on Inquiry Card

Hose Fittings and Hose

An 8-page illustrated catalog of hose fittings and hose is published by Lenz Company, Dayton, Ohio. Detailed with specification tables are reusable hose fittings, assemblies, adapters, and single and double wire braid hose. These components are designed for universal industrial applications.

Circle **Item 23** on Inquiry Card



Home Insulations

A reference manual on home insulations is published by Owens-Corning Fiberglas Corp., Toledo, Ohio. The 24-page booklet includes design principles, design standards, application standards, and product information. Engineering section gives cost data, average annual cooling degree days.

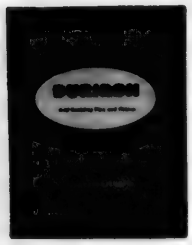
Circle **Item 24** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.

Building Trades Pumps

Complete product descriptions, dimensions, application data and performance characteristics of an augmented line of building trades pumps, called AquaLine, are included in bulletin from manufacturer, Peerless Pump Div., Food Machinery and Chemical Corp., Los Angeles, Calif.

Circle **Item 25** on Inquiry Card



Acid Resisting Pipe, Fittings

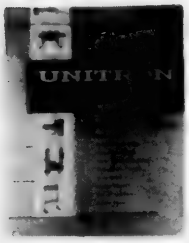
Two bulletins are offered by The Duriron Co., Inc., Dayton, Ohio. One, PF/4c, describes Duriron acid resisting pipe and fittings for corrosive wastes. The other, PF/2a, covers Duriron and Durichlor split-flanged pipe and fittings for corrosion-resistant process piping.

Circle **Item 26** on Inquiry Card

Controlled Ventilation

A 20-page catalog from Loren Cook Co., Berea, Ohio, provides a carefully developed guide for better air control to help industrial users determine exact ventilation equipment best suited for specific needs. Guide matches design features with ventilation requirements and special conditions.

Circle **Item 27** on Inquiry Card



Carriers and Closet Fittings

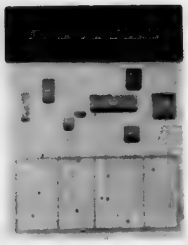
Catalog F-2, from Josam Manufacturing Co., Michigan City, Ind., describes Unitron carriers and fittings for wall-hung fixtures. The 28-page catalog is designed to provide aid in specifying, selecting and ordering carriers and fittings for closets, urinals, lavatories and sinks.

Circle **Item 28** on Inquiry Card

Equipment Leasing Plan

United States Leasing Corp., San Francisco, Calif., offers a 6-page brochure explaining its program of leasing diversified, non-expendable equipment and fixtures to all types of business and industries. This includes general office equipment as well as production equipment.

Circle **Item 29** on Inquiry Card



Flexible Files

How files can be self-designed through use of company's Record-Stack is told in 4-page folder published by Remington Rand Div., Sperry Rand Corp., New York, N. Y. The bulletin describes a wide choice of interchangeable files, drawers, and shelves.

Circle **Item 30** on Inquiry Card

Structural Support Products

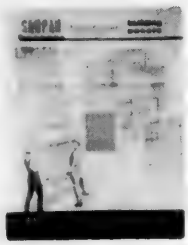
Kindorf channel, fittings, hangers and supports are described in new catalog-handbook published by Steel City Electric Co., Pittsburgh, Pa. It contains product illustrations and information for correctly specifying and using these structural support materials for electrical installations.

Circle **Item 31** on Inquiry Card

Ammonia Valves, Refrigeration Products

The tenth edition of its catalog on ammonia valves and refrigeration products is offered by Cyrus Shank Co., Chicago, Ill. Products are described completely, and illustrated by means of photos and cross-sectional views. A line of 300-lb malleable iron fittings is included.

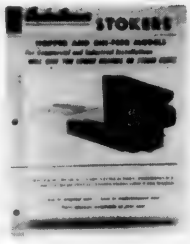
Circle **Item 32** on Inquiry Card



Translucent Building Panels

Translucent building panels, tradenamed Sanpan, are described in 8-page bulletin by manufacturer, Panel Structures Inc., East Orange, N. J. Bulletin provides complete selection data for these structural sandwich panels, which are suited for curtain walls, exterior wall panels, etc.

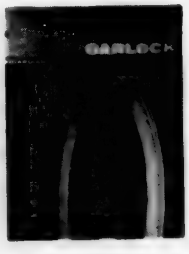
Circle **Item 33** on Inquiry Card



Coal Firing Equipment

Automatic coal firing equipment available from Automatic Solid Fuels Equipment, Inc., Indianapolis, Ind., is described in a 6-page bulletin. For commercial and industrial installations, hopper and bin-feed loaders and stokers are reported to give lower heating or steam costs.

Circle **Item 34** on Inquiry Card



Spiral-Wound Metal Gaskets

Guardian spiral-wound metal gaskets, for high temperatures and pressures in flanged joints, valve bonnets, boiler tube caps, handholes and manholes, are described in a 12-page catalog offered by The Garlock Packing Co., Palmyra, N. Y. Complete selection and ordering data are included.

Circle **Item 35** on Inquiry Card

Air Velocity Measurement

Instruments for the precision measurement of air velocity in industrial, commercial and laboratory applications are covered in 4-page Catalog No. 170, published by Hastings-Raydist, Inc., Hampton, Va. Various types of probes, meters, and dial faces are illustrated and described.

Circle **Item 36** on Inquiry Card

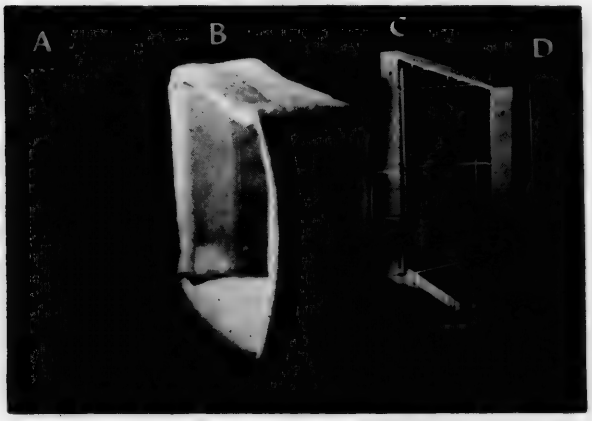
NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

Cubic Air Filter Offers Savings

Substantial savings in filter costs are possible with a uniquely constructed "cube" replacement air filter introduced by Union Carbide Development Co., Div. of Union Carbide Corp., New York, N.Y.

While combining high efficiency with exceptionally low pressure drop throughout its useful life, the new ULOK unit is demonstrating in field tests in the New York Metropolitan area a service life at least six times longer than conventional throw-aways and permanent metal type filters.



The high capacity filtering action of the unit is attributed to a lightweight Dynel modacrylic filtering medium, a uniquely processed filter batt, and open-side cube construction. Filters are designed for use in commercial and industrial air conditioning and heating, dust entrapment, and process air systems.

Shaped like an open box, the filter is made up of four components, as shown in photo: A—rust-proof inside retainer that fits inside the medium to hold it rigid; B—disposable, 2-inch thick, Dynel filter medium; C—holding frame, permanently fastened in sheet metal duct; and D—outer basket or retainer into which medium fits.

In operation, the air stream carries the dirt into the cube to the front surface of the downstream face of the filter. As dirt builds up on the downstream face, air flow is shunted to the sides of the cube. Coarse material continues to be caught on the downstream face, the company explains, while the large filter area of the four sides traps the fine particles. The result of this progressive "reverse loading" is that the unit shows an unusually low pressure drop even after it has collected several pounds of dirt.

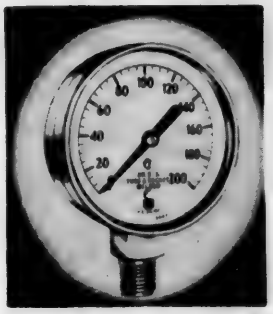
Rated at 0.04 inches pressure drop at 2000 cfm, the 20 by 20 by 20 inch filter unit offer users low-pressure-drop service in a high velocity system. Ratings of this sort also offer design engineers the opportunity of considerably reducing the size of a filter bank, according to the company.

Units are available with standard face areas measuring 20 by 20, 20 by 25, 16 by 20, or 16 by 25 inches. For each of these, there are units that measure 8, 11, and 20 inches in the direction parallel to the air stream. When after long service, the filters have been filled to operating capacity, they may be collapsed flat and discarded.

More information? Circle Item 37, postcard, last page.

All-Stainless Steel Pressure Gages

A line of drawn case pressure gages with all components made of stainless steel is announced by United States Gauge Div., American Machine and Metals, Inc., Sellersville, Pa. The new line will find use in corrosive atmospheres and media.



Type 316 stainless steel Bourdon tube, movement, socket (welded), case, and ring are incorporated in the design. The gage meets ASA Grade B specifications—including an accuracy of 2% at the middle, or working half of scale (3% for the remainder).

The gage is available in standard ranges up to 5000 psi, and in dial sizes of 2, 2½, and 3 inches.

More information? Circle Item 38, postcard, last page.

Pumps for Air Conditioning

Worthington Corp., Harrison, N. J., announces a new line of pumps, called Econobloc, designed for economical application in the air conditioning industry. The pumps, available in 6 sizes in the fractional horsepower range,

deliver up to 80 gpm at heads to 110 ft. They feature higher efficiencies, a reliable and easily replaceable mechanical seal, and space-saving compactness of design.

Die-cast aluminum bronze impellers with shell-molded casings insure smoother waterways, and on the smaller sizes, the mechanical seal can be serviced without disturbing either suction or discharge piping.

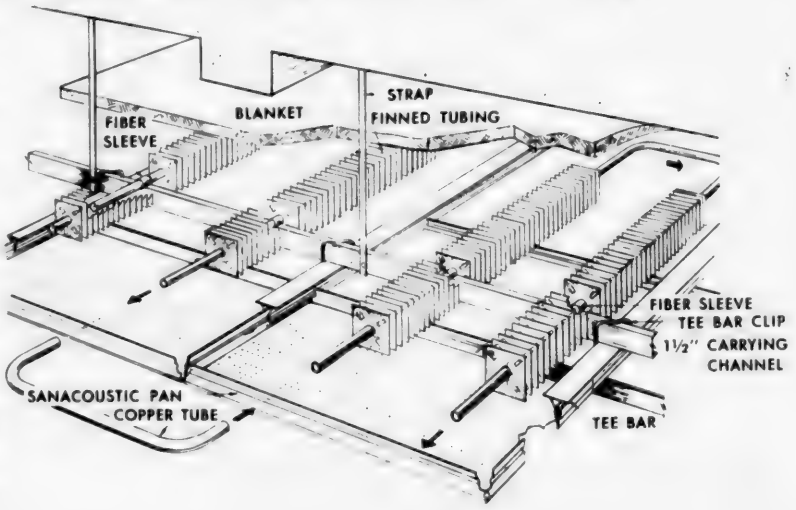
The line is also available in sizes up to 7½ hp.

More information? Circle Item 39, postcard, last page.

Radiant Ceiling for Heating, Cooling, Sound Conditioning

A system for radiant heating, cooling, and sound-conditioning, called Sanacoustic HCS, is announced by Johns-Manville Corp., New York, N. Y. In addition to providing no-draft heating and cooling, the system absorbs up to 90% of the sound that strikes it.

Made entirely of standard components, system is easy to install and economical to maintain, the company states. Because the heating and cooling is in the ceiling, total floor area is unencumbered, providing more usable space and greater flexibility for changing interior requirements. Also, fan rooms and risers can be smaller, ductwork can be 50 to 75% eliminated, permitting lower floor-to-ceiling heights, and fuel savings can range to 20%.



Basic components of the system are, as illustrated: (1) water-carrying coils, (2) a sound-absorbing insulating blanket, and (3) perforated metal panels which form the finished ceiling.

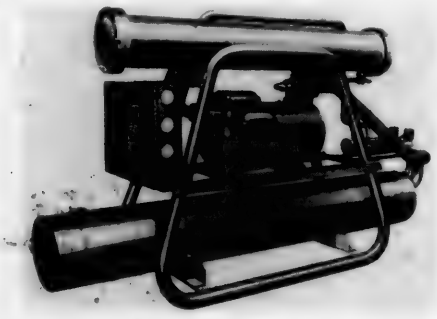
In heating, circulating warm water inside the tubing provides heat which is radiated to the steel panels and then downward to room surfaces and occupants. In cooling, excess heat from room surfaces and occupants is radiated to the ceiling surface and carried away by cool water circulating in the same coils. Temperature of the water must be controlled to prevent condensation.

The entire system—carrying channels, water coils, acoustical blanket, ceiling panels and trim—is installed under the complete responsibility of Johns-Manville.

More information? Circle Item 40, postcard, last page.

Hermetic Reciprocating Chiller

Redesign of its Reciprocating Cold Generator, a package water chiller for comfort and process applications, is announced by The Trane Co., La Crosse, Wis. The unit is said to be more dependable, quieter, and easier to maintain. Much of this was achieved by incorporation of the company's newly developed hermetic reciprocating compressor.



Units are available in ten sizes, from 10 to 100 tons. All models are small enough to pass through a standard 36-inch wide commercial door.

The hermetic reciprocating compressor is designed for Refrigerants 12 and 22, and operates at 1750 rpm. It has a volumetric efficiency of 85% at 40 deg F suction and 105 deg condensing temperature. Multistep capacity control reduces starting and stopping of the compressor and reduces power requirements, the company says.

Hermetic design contributes to quiet operation. The compressor and its driving electric motor are enclosed in a single thick-walled cast iron shell. This arrangement eliminates the coupling, along with the possibility of misalignment and attendant noise and service problems. The compressor-motor shell has a bolted end cover for easy access.

Of the direct-expansion type, the evaporator, with refrigerant in the tubes and water in the shell is designed, rated and fabricated by Trane, and carries full ASME certification. Urethane foam insulation covered with a 20-gage steel jacket prevents heat pickup and condensation on the shell. This type of evaporator, rather than the flooded type, is used because it is easier to control, requires less maintenance, uses a minimum amount of refrigerant, and assures proper return of oil to the compressor, the company states.

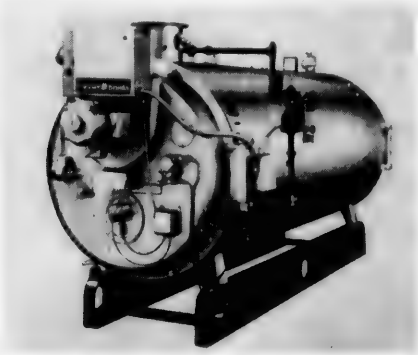
Shell-and-tube condensers, built in accordance with the ASME code for Unfired Pressure Vessels, are also used. They feature internal fin copper tubes and a refrigerant liquid sub-cooler. A spring loaded pressure relief valve is set and sealed at the factory. If it is desirable to use evaporative or air-cooled condensers instead, the chillers are available less water-cooled condensers.

Chillers are furnished with either pneumatic or electric controls. Factory-wired control panels, mounted on the unit, contain the starter, a modulating temperature controller, safety thermostat, pressure switch, a non-cycling relay, an on-off switch and terminal strip.

More information? Circle Item 41, postcard, last page.

Extends Packaged Boiler Line

Cleaver-Brooks Co., Milwaukee, Wis., announces extensions of its packaged, fire-tube boiler line to fully capitalize on markets in areas of the country where gas is the dominant fuel.



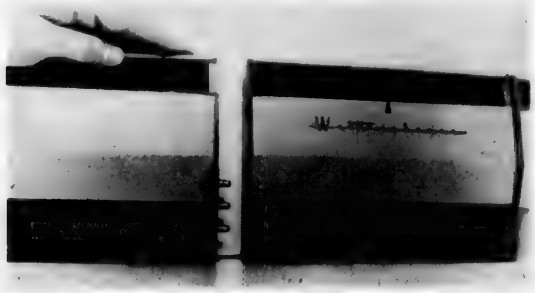
Called CBH, the low-cost line is expected to provide backup for the company's existing CB, Progress and Monitor lines. It is designed to handle gas or light oil or gas/light oil combinations. It is not designed for heavy oil firing.

Line offers firing and controls tailor-made for the majority of heating and process loads in the 25 through 100 hp range. The line includes both high and low pressure boilers—high pressure units designed for applications in small and medium industries such as dairies, laundries and dry cleaners, and low pressure units for heating offices, schools, churches, public and institutional buildings.

More information? Circle Item 42, postcard, last page.

Baseboard Sections Plug Together

A line of baseboard electric heating equipment introduced by Westinghouse Electric Corp., Pittsburgh, Pa., features the use of modular plug-in sections that cut installation time considerably. Although more compact than previous baseboard models, these units provide the same output—250 watts per linear foot—while the surface is comfortable to touch.



The plug-in feature simplifies installation since electrical connections are required at one point only—in the control section. Additional sections are installed by plugging-in to the control section through a concealed three-pronged connection. This double-male grounded plug provides continuous flow of power to each section. The units are easily fastened to the wall to complete the installation.

One standard 2-ft length is available because of the flexibility provided by the plug-in feature. This eliminates the need for dealers and distributors to stock a number of baseboard sizes. In addition, the line includes a new "universal" corner section which can be used to provide continuous right angle connection for either an "inside" or "outside" corner.

More information? Circle Item 43, postcard, last page.

Indicating Transmitter

An indicating transmitter for low-to-medium pressures, Model 231, which can be located to provide pressure indication at the point of measurement (or within 300 ft) on an easy-to-read dial, is available from The Hays Corp., Michigan City, Ind.

This same unit can simultaneously transmit the pressure measurement electrically to any Hays remote-located recorder or indicator, the company says.

This combination provides the flexibility of having the pressure indication exactly at the point of measurement of the process — and still being able to record and indicate that same measurement on a panel board or control center at a distant location.

Its application is measurement of pressure (or draft), differential pressure (flow) of air or non-corrosive gases, ranges from 0-0.2 to 0-120 inches water, and for static pressure up to 65 psig. The unit has additional flexibility, in that field conversions can be made easily from pressure to suction or to differential service.

The only piping connections are to the transmitter itself; the only wiring connections required consisting of three-wire transmission to the remote receiver.

More information? Circle Item 44, postcard, last page.

Removes Silica from Feedwater

A process, tradenamed Desilicizer, which reduced silica in boiler feed make-up to less than 0.5 parts per million is announced by Cochrane Corp., Philadelphia, Pa. The process also eliminates HCO_3 and CO_3 alkalinity.

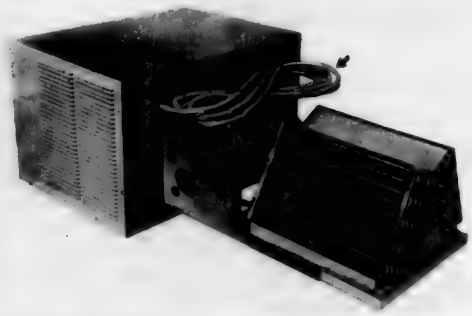
According to the company, the system requires little maintenance, is low in cost, and is very simple to operate. It is particularly suitable for medium pressure boilers (450 to 1100 psig) and can be added to existing Zeolite softener systems.

More information? Circle Item 45, postcard, last page.

Pre-Charged Remote Air Conditioner

What is described as a completely new concept in whole-house air conditioning that will permit a builder to include central air conditioning in a home at a price far below conventional systems, is introduced by Fedders Corp., Maspeth, N.Y.

This development, for which a patent has been applied, involves a remote air conditioner that is completely charged and pre-tested at the factory and can be installed through a wall. The company calls its new unit Flex-Hermetic.



Key to the system is an 18-ft length of flexible armor-covered tubing (indicated by arrow in photo) that permits the evaporator coil to be installed as much as 18 ft from the outdoor compressor section. With the outdoor section secured through a basement wall, the evaporator is simply carried to the warm air furnace as the coil unwinds.

The Flex-Hermetic is a 2-hp unit with a capacity of 22,000 Btu per hr. It is designed for use with three models of the company's new Trophy gas and oil-fired warm air furnace. According to a company spokesman, this unit will bring the price level of whole-house air conditioning down to a point where it will be practical to tract builders.

Gas and Oil Furnaces

The Trophy furnace line consists of 11 gas and 9 oil-fired models and represents the firm's entry into the warm air heating business. (The company has long been a producer of baseboard radiation, convectors, wall radiation and unit heaters.)

Seven of the gas and six of the oil-fired furnaces are designed as heating-cooling furnaces so that remote air conditioning can be added at any time without any additional components required. These models have a relay and a properly-sized transformer already wired into the furnace controls as well as belt-driven blowers, with variable-pitch pulleys, that are sized to perform properly during the system's heating as well as cooling functions.

The gas-fired heating-cooling units are available in 100,000, 125,000 and 150,000 Btu capacities while the oil-fired models are offered in capacities of 112,000, 140,000 and 168,000 Btu.

In a straight heating furnace line, there are four gas (75,000, 100,000, 125,000 and 150,000 Btu) and three oil models (112,000, 140,000 and 168,000 Btu). Four of the units are belt driven and three have direct drive.

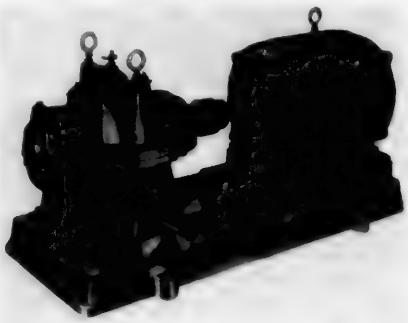
All of the gas and oil furnaces are shipped completely assembled with all of the controls pre-wired. The oil models stand 57 inches high while the gas is 56 inches high. The width depends on the capacity. All of the units are fully enclosed and are smartly styled in tan and brown enamel.

More information? Circle Item 46, postcard, last page.

Pump Has Mechanical Seal

Weil Pump Co., Chicago, Ill., announces a horizontally split case pump, Type AY, with mechanical seal, designed for leak-proof operation.

Pump is specially adaptable for air conditioning service, booster pump service, heating systems and water



supply systems. Designed for heavy duty, long hour service, pump is practically free from maintenance costs, and is built to operate with an absolute minimum of vibration and noise, the company states.

Available in discharge sizes up to 6 inches with capacities to 2000 gpm, and heads to 400 ft. Motors can be supplied 1750 or 3450 rpm.

More information? Circle Item 47, postcard, last page.

Multiple Wall Drinking Fountain

A new multiple wall drinking fountain, molded in colorful fiberglass with two bubblers, is manufactured by Haws Drinking Faucet Co., Berkeley, Calif. Designated Model 10F, it features the same flowing lines as Haws Model

10Y (3 bubbler unit) that has been available for two years.

Fiberglass models are available in a selection of permanently bonded decorator colors at no extra cost. Overall length is 39½ inches; shipping weight is 27 lb.

More information? Circle Item 48, postcard, last page.

Two Hose Stations

Leonard Valve Co., Cranston, R. I., announces two hose stations for delivering hot water at controlled temperatures to the dairy and bottling industries, hospitals, restaurants, food processors, chemical plants, etc. These basic types are thermostatic steam and water mixers, (one is illustrated) and steam and water blenders.

Thermostatic steam and water mixers safely deliver hot water at exactly controlled temperatures. The operator selects the desired temperperatures with the regulator handle. Bimetal thermostat automatically maintains this temperature. Ideal for the dairy field and hospitals, this Hose Station produces hot water by automatically mixing different combinations of hot water, cold water and steam. Changes or failures in supply line pressures and temperatures are automatically compensated for. The units can be specified in several different combinations by the selection of thermometers, vacuum breakers, mounting brackets, floor stands and wall cabinets.

Steam and water blenders, manually-operated units, are used where thermostatic control is not necessary. The blenders are easily and quickly adjusted to the desired temperature and volume for washing down trucks or other equipment, hosing down floors, flushing vats or tubs, cleaning swimming pools, and many other applications. The blending chamber contains no moving parts and operates without annoying noise or pulsation.

Both stations are equipped with ¾-inch stop and check valves, ¾-inch hose connections, and a handy stainless steel hose rack. Piping is exposed or concealed, depending upon application.

More information? Circle Item 49, postcard, last page.

Tower, Condenser Chemical Control

The Chemicator is a new method for feeding balanced chemical treatment into circulating water systems of cooling towers and evaporative condensers, states Erlen Products Co., Burbank, Calif.

The unit is a small, lightweight, closed reservoir, mounted on the side of the equipment, through which a portion of the recirculating water flows. On the upper portion of the device a sleeve holds a weather-sealed plastic tube containing a sequence of variously formulated compressed chemical briquettes. These are made of polyphosphates and organic chelates to remove and prevent the formation of scale, organic corrosion inhibitors to remove and prevent the formation of rust, together with automatic pH, algae and slime controls. No injurious chromates or phenols are used. As the briquettes are gravity-fed into the water flowing through the reservoir, they slowly dissolve and are carried into the entire water system.

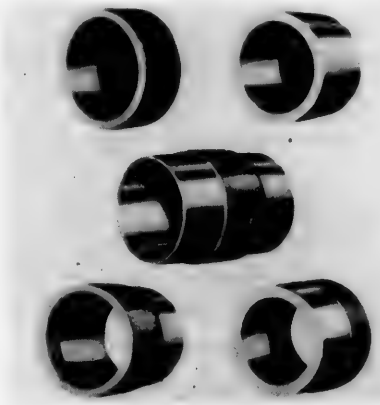
Advantages of the system are that there are no chemicals to weigh or mix, no acids to handle, no noxious odors to endure, and less hazardous climbing. The feeder has no moving parts, yet feeds the proper chemicals in precise amounts. Flow of the recirculating water controls the system. Chemicals are fed only when the pump is in operation, only when they are needed, at a pre-determined rate required for positive control, the company states.

Briquettes are custom formulated and are packaged in many different combinations to combat practically every known water problem of any geographical area.

More information? Circle Item 50, postcard, last page.

Fiber Adapters, Plugs, Caps

A line of Permaline fiber pipe accessories is produced by Line Material Industries, McGraw-Edison Co., Milwaukee, Wis. Among the accessories are adapters for joining the following: 4-inch fiber pipe to 4-inch asbestos cement pipe; 3-inch fiber pipe to 4-inch asbestos cement; and, 4-inch fiber pipe to 3½-inch brass cleanout plugs.



Also included, to facilitate temporary or permanent termination of fiber pipe runs, are fiber caps for the tapered end of 2-, 3-, 4-, 5-, 6-, and 8-inch pipe, and fiber plugs for 3- and 4-inch coupling or tapered hub of fittings.

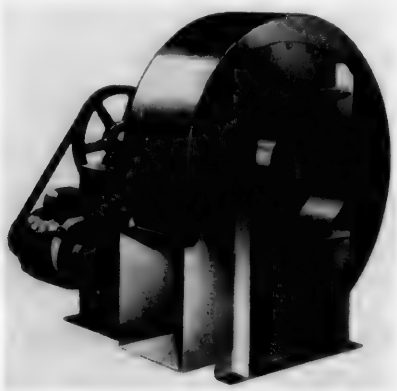
These accessories are impervious to soil acids, household chemicals, corrosion, and alternate freezing and thawing, the company states. They make a waterproof and rootproof joint with other components of pipe runs. High crushing strength is said to assure long life and excellent performance.

The company manufactures fiber pipe in diameters of 2, 3, 4, 5, and 6 inches. These diameters are available in 5-, 8-, and 10-ft lengths. Pipe with an 8-inch diameter is produced in 5-ft lengths.

More information? Circle Item 51, postcard, last page.

Industrial Fan Line

A line of gas, fume and material handling fans for industrial applications is offered by The Trane Co., La Crosse, Wis. Fans come in three basic wheel designs for handling gases, corrosive fumes, granular or fibrous materials. All AMCA standard wheel sizes from 19⅛ to 64⅜ inches are available. A range of 11 inlet sizes from 11 to 37 inches and five arrangements meet the needs of many industrial processes. All fans have AMCA certified ratings.



All wheels are electronically balanced. Fans have heavy-duty ball bearings and close tolerance shafts for efficient, smooth operation, the company states. The material handling wheels have been designed to simplify field repair.

Air handling wheels in the new line have backwardly inclined blades for top efficiency. A granular materials handling wheel for use in pneumatic conveyor systems has straight blades for long wear. A stringy materials handling wheel is without side plates to permit easy passage of fibrous materials like those found in textile and woodworking mills.

Optional fan accessories include cooling wheels, shaft seals, dampers, access doors. Trane Industrial Fans are available with various corrosion resistant coatings, or can be built of corrosion resistant metals.

More information? Circle Item 52, postcard, last page.

New Sectional Insulation

Zebra is the name of an insulating material developed by Keasbey & Mattison Co., Ambler, Pa., manufacturers of asbestos heat insulating products. It is described as a multi-layer, sectional type thermal insulation primarily composed of calcium silicate-asbestos fiber bonded felts. It is designed for temperatures ranging from 200 to 1200 deg F.

Insulation is supplied in simplified thicknesses and is the result of a new manufacturing process. For pipe sizes ½ to 6 inches dia, it is available in nominal thicknesses of 1 to 4 inches; for pipe 7 to 24 inches dia, it is available in thicknesses of 1½ to 4 inches; in sectional form or tubular form on request.

In addition to greater resistance to shock, other qualities of the insulation are said to include improved handling characteristics plus easier installation in single layer thicknesses in sectional form for pipe up to 24 inches dia. It is also available in larger sizes on request. Its smooth surface virtually eliminates the possibility of skin irritation.

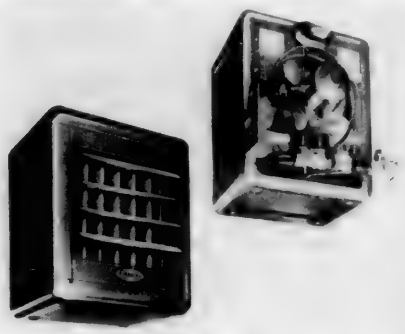
The company expects its product to find wide application in the power plant, marine, and petro-chemical fields.

More information? Circle Item 53, postcard, last page.

Gas-Fired Unit Heater

Lower operating cost and the elimination of sudden blasts of hot air are two benefits derived from a new type of gas-fired unit heater announced by Carrier Corp., Syracuse, N. Y.

The trim, compact device is the first fully automatic,



two-speed propeller-type unit heater approved by the American Gas Association, according to the company. It is designed for use in small offices and stores.

Unit begins operating at a low heat output and fan speed under the control of a sensitive two-stage thermostat. The initial low speed is maintained unless more capacity is needed. The thermostat then automatically shifts to high heat output and fan speed. Unit is presently offered with an output of 30,000 Btu in the low stage, and 50,000 Btu in the high stage.

More information? Circle Item 54, postcard, last page.

Five Packaged Units Added

Five small economy models have been added to the basic PAC line of packaged air conditioners by Acme Industries, Inc., Jackson, Mich.

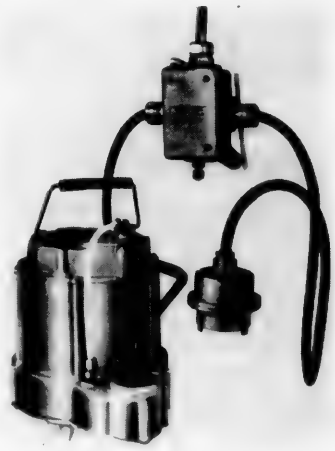
The five PAC-B models, all of the evaporative condenser type, fill out a series of compact models which are said by the company to be considerably smaller than competitive lines in the 20 to 60-ton capacity range of packaged air conditioners. These new models are in capacities of 25, 30, 40, 50 and 60 tons.

All units feature smaller outside casings, and include multiple compressor units. They are equipped with 10- and 15-hp. compressors which, through a two-step thermostat, handle partial loads by cutting in or out. Also available are four-step units with two thermostats. In both systems a small delay in timing allows succeeding compressor units to enter the phase in sequence.

More information? Circle Item 55, postcard, last page.

Complete Pump Package

A complete pump package with a variable high-turn-on control, said to eliminate frequent pump cycling and make possible removal of measured amounts of fluid determined by the location or height at which the turn-on control is positioned, is introduced by Kenco Pump Div., American Crucible Products Co., Lorain, Ohio.



Economy of this package is further increased, the manufacturer states, by its watertight design for operation in humid atmospheres or where flooding of the power source is apt to occur. In addition to its separate high-turn-on control and Kenco submersible pump, package includes a watertight junction box, gasketed cover, watertight power cord and 100 ft of polyethylene tubing to accompany the feeder cable to the power source to assure moisture-free breather action.

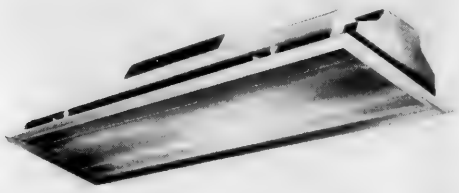
Package is available with either Model 119 submersible pump, with a capacity of 3300 gph at 10-ft discharge head, or Model 130, with a capacity of 5000 gph at a 10-ft head.

Equipped with variable high-turn-on control, pumps can be used to control the flow and supply of fluids in storage tanks, effluent disposal systems, industrial fluid transfer, or other applications where controlled volume removal or reduction in cycling is important.

More information? Circle Item 56, postcard, last page.

Combination Light and Air Diffuser

In response to requests for a recessed air diffuser incorporating an enclosed light troffer unit, Barber-Colman Co., Rockford, Ill., in its Barber-Colman—Day-Brite research facilities, has developed a unique design. This new diffuser is available in 1- x 4-ft and 2- x 4-ft sizes and two, three or four fluorescent tubes.



Engineered air distribution, for year-round air conditioning, is provided by this diffuser through slots along both sides of the light fixture. A 5-inch expanding cone damper, for controlling air volume, is accessible by unlatching the bottom of the diffuser. Discharge air is completely separated from ballasts, fluorescent tubes and reflecting surfaces.

More information? Circle Item 57, postcard, last page.

Plastic Bathroom Fixtures

Entry into the plumbing products field with a line of reinforced plastic bathroom fixtures was announced by Rocky Mountain Fiberglass Div., Denver Metals & Chemicals Corp., Denver, Colo. The division manufactures products and surfaces of sprayed fiberglass and resin laminate.

The new line, marketed under the trade name Fibersheen, consists initially of shower stalls and receptors, bathtubs, and lavatory-vanities. They are designed for home as well as institutional use.

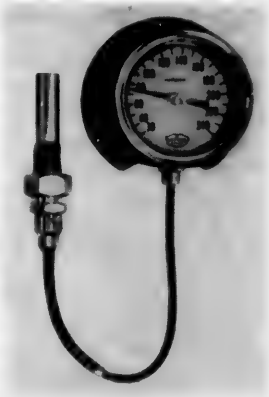
Each of the four items is of one-piece, lightweight, seamless construction for rapid installation under any circumstances. Described as virtually indestructible, the company state that they cannot leak, will not chip, rust or rot out and have hard, nonporous surfaces which are easily cleaned with soap or detergent. Each is available in shades of white, grey, green, tan, pink and sun yellow, with gold flecks.

According to the manufacturer, consumer acceptance of reinforced plastic plumbing fixtures is beginning to accelerate at a rapid pace, and plastic fixtures will be a major factor in the market within the next five years.

More information? Circle Item 58, postcard, last page.

Dial Thermometers for Piping

These mercury-actuated dial thermometers for piping installations feature ease of reading and dependable accuracy throughout the working range, uniform graduating scale for the entire range, a micro-meter adjustable pointer, and an all stainless steel system for quick response and long life.



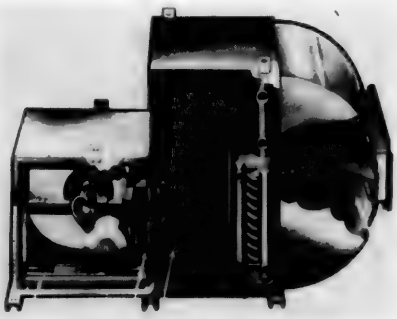
Manufactured by Weksler Instruments Corp., Freeport, N.Y., gages are enclosed in black enameled aluminum cases with chrome plated slip ring, furnished with brass separable socket and an extension neck. They are also available with fully compensated lines up to 200 ft in length. Other case materials are also available. Sockets are interchangeable for ½, ¾ or 1-inch NPT in standard 3½ and 6-inch extension neck types. Case design permits installation for adjustable angle, rigid or remote reading.

Sizes include 4½, 6 and 8½ inch dials. Six standard temperature ranges are offered.

More information? Circle Item 59, postcard, last page.

High-Velocity Conditioners

A redesigned and improved line of high-velocity conditioning equipment for multi-story application is offered in nine models, in capacities from 3,500 to 27,000 cfm, for dry expansion, cold water, hot water, and steam, by Drayer-Hanson, division of National U.S. Radiator Co., Los Angeles, Calif.



Engineered for hot and cold duct operation at static pressures from 2½ to 8 inches, the line is redesigned to incorporate a plenum divider for ease of connecting ductwork on a double-duct system. Units have only two bearings, even on two-fan types, to eliminate alignment problems on the fan. Bearings are life-time lubricated.

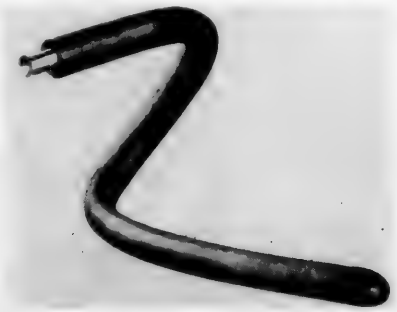
Blow-thru type models, designated HCD, offer unlimited flexibility to planners, it is stated. The line is specifically designed for high pressure performance. It is not an adaptation of standard low-pressure air-handlers.

The option of horizontal or vertical discharge is offered. Fan and motor assembly is spring-mounted for total internal vibration isolation. Discharge plenum and baffle divide hot and cold sections. Insulation is ½-inch fiber glass, covered with vinyl.

More information? Circle Item 60, postcard, last page.

Slip-on Pipe Insulation

A preformed Neoprene insulation which readily slips onto straight, bent or coiled pipe or tubing for anti-sweat protection is called Flex-Sulation by the manufacturer, Grant Wilson, Inc., Chicago, Ill. It is available in 6-ft lengths with ⅜- or ½-inch wall thicknesses for



copper tubing from ¼ to 3 inches, and iron pipe from ¼ to 2½-inch pipe sizes.

Non-inflammable Neoprene is extremely light in weight (7.88 lb per cu ft), resists acid, oil and alkalis and is non-toxic. It resists rodent, fungus and vermin attack and is water and air tight. Less than 7% moisture is absorbed after 15 days immersion. Closed-cell construction is said to prevent internal oxidation for indefinite insulation life. Insulation has a *k*-factor of 0.30 Btu at 120 deg F.

The product can also be slit for installation on existing piping or tubing. On such applications, No. 2002 adhesive is used to secure the insulation after it is on.

More information? Circle Item 61, postcard, last page.

Motorized Zone Control Valve

A motorized zone control valve for hydronic heating and cooling systems and for steam up to 10 psi is introduced by A. W. Cash Valve Mfg. Corp., Decatur, Ill. Designated the Hydrozone motorized valve, it features four body types for varying job conditions. Valve has a visual valve stem indicator, and is easily set for manual operation in case of power failure.

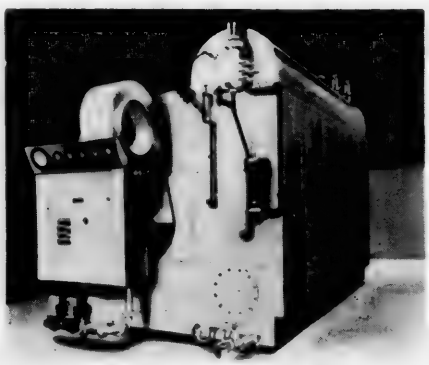
It is reported to be the only zone control valve designed to fit and operate inside the most modern type of baseboard heating units, and is rugged enough to be used on mains and on all types of free-standing radiation. Its design permits liquid to flow in either direction through valve.

More information? Circle Item 62, postcard, last page.

28 Steam Boilers

Twenty-eight sizes comprise the Series 40, 50, 60, 70 and 80 boilers for steam requirements from 7100 to 52,980 lb per hr and design pressures to 500 psig announces Nebraska Boiler and Supply Co., Lincoln, Neb.

Boiler features include compliance with military speci-

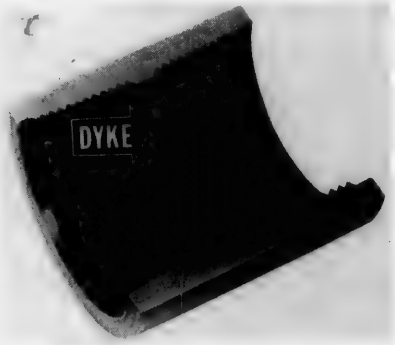


fications, factory or on-the-job assembly, optional location of burner and flue gas outlet. Furnished with trimmings, steam separator, soot blower, and feedwater regulator. A wide variety of fuel burning and control equipment may be selected to comply with requirements.

More information? Circle Item 63, postcard, last page.

Plastic Insulating Coupling

After several years of field testing, a fiberglass-reinforced epoxy line insulating coupling is in production at Ed Conley Plastic Corp., Tulsa, Okla. According to the manufacturer, it will stand comparative tests with any couplings now being made, whether of steel or plastic.



Couplings will stop electrolysis and corrosion where dissimilar metals, stray currents, soil conditions, and chemicals are contributing factors.

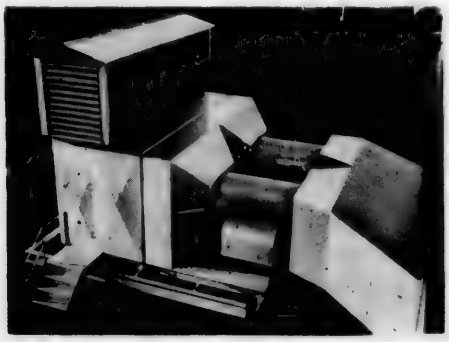
Operation at 150 psi can be maintained with a safety factor of over 10:1. Operating temperatures up to 300 deg F are feasible if non-shock pressures do not exceed 100 psi.

Note integral dyke in photo, which prevents metal-to-metal contact. Couplings are available in 1, 2, 2½, 3 and 4-inch standard iron pipe threads. Special sizes are made to order.

More information? Circle Item 64, postcard, last page.

Industrial Warm Air Package

A largest-of-its-kind direct-gas-fired package unit for supplying warm air to industrial plants is announced by Metals Engineering and Manufacturing Co., Inc., Detroit, Mich. These units are designed to supply replacement air in plants that are air-starved due to evacuation by exhaust systems venting fumes, gases and solid particles. Multiple installations are made with sufficient capacity to provide a pressure curtain at exhaust booths, thereby assuring required venting efficiency.



Air intake is from a four-direction louver tower giving ample air supply no matter what the wind velocity or direction. Motor actuated dampers seal off ceiling air intake in combustion chamber—open when gas burner ignites. Push buttons on the factory floor control start and stop of operating cycle, otherwise the unit operates automatically to supply 150,000 cfm of warm air.

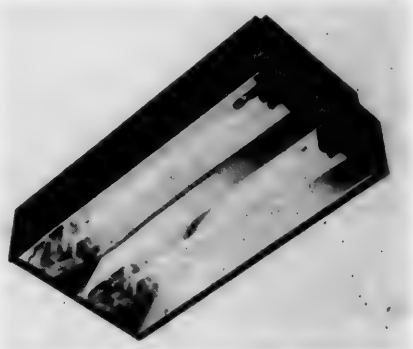
A premix 15 million Btu Maxon gas burner, with stainless steel baffle wings that protect flame and disperse heat into air stream, automatically adjusts to control flame in direct relation to temperature changes. Two 40-hp low velocity axial fans pull air through the combustion chamber into plenum and distribution chamber where over a hundred individually adjustable 3 x 5 ft registers disperse the warm air. Units down to 4000 cfm capacity are available.

More information? Circle Item 65, postcard, last page.

Electric Radiant Heating Units

Development of infrared heating units said to make reflected radiant heating practical for almost all indoor and outdoor, open-area applications is announced by Luminator, Inc., Chicago, Ill.

Units are designed with highly efficient reflectors for use with General Electric T-3 tubular quartz infrared lamps having filament temperatures in excess of 4,000 deg F. These infrared lamps convert approximately 85%



of their energy into radiant heat. Units project heat to specific areas. This eliminates the need for using economically wasteful conventional space heating systems which must warm huge volumes of air in order to maintain warmth in only a relatively small part of large, open areas, according to the company.

Heating units are particularly suited for use in such high-bay buildings as aircraft hangars, maintenance shops, warehouses, etc., where they can be installed to economically project heat only to specific work areas where warmth is required. A few of the many outdoor applications are: loading platforms, grandstands, drive-in-restaurants, walkways, patios, terraces, entrances and other exposed areas where people must work during cold weather. Regardless of surrounding temperatures, anyone stepping within the projection area of the unit immediately feels comfortably warm, the company states.

According to the company, operating costs for its units are comparable to and often less than gas, coal, and oil heating costs for open-area applications where overall warmth is not necessary.

More information? Circle Item 66, postcard, last page.

Perforated Asbestos-Cement Pipe

Many problems formerly encountered in subsurface drainage of highways, airports, flood control projects, plant sites, and other locations have been solved economically by a new perforated asbestos-cement pipe. It offers, in subgrade stabilization projects, installation and performance advantages previously unavailable in a single product. This product, Transite Underdrain Pipe, was developed by Johns-Manville, New York, N.Y.

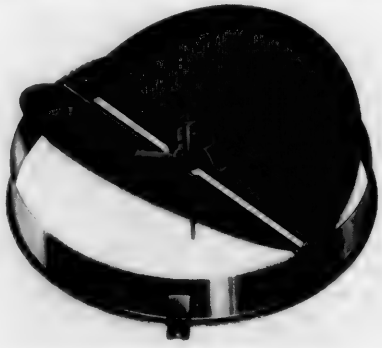
Formed basically of asbestos fibers and cement, the dense uniform structure of this pipe gives it great crushing strength, making possible an economical wall thickness that assures an extremely good weight-strength ratio, the company reports. Its smooth, uniform interior and resistance to corrosion assure a low frictional resistance to flow of water that continues low throughout the life of the line.

Pipe is available in 6- and 8-inch diameters in 10-ft lengths, and 10- and 12-inch diameters in 13-ft lengths. A full line of elbows, tees, wyes, crosses, end caps, increasers, and similar fittings is available in each size.

More information? Circle Item 67, postcard, last page.

Ceiling Diffuser Damper

A ceiling diffuser damper is announced by Air Control Products, Inc., Coopersville, Mich., with the company's Adjusto-Stop at the diffuser face. One simple screwdriver



adjustment after installation stops damper at pre-determined opening. There is no interference with closing action.

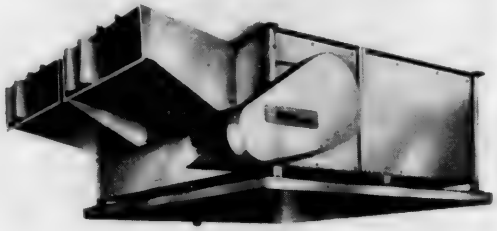
A unique screw-type operator rack and pinion gear opens and closes damper without effort, eliminating chains and springs.

According to the manufacturer, even under extreme air velocities there is no rattle. Nylon rack and steel pinion gears hold damper firmly in place. Use on evaporative cooling systems is recommended.

More information? Circle Item 68, postcard, last page.

Ceiling Type Evaporator

Imeco, Inc., Chicago, Ill., announces a new line of space coolers arranged for ceiling mounting. Provided with a fin coil, in a variety of fin spacings and depth of rows, any desired balance of air volume and coil capacity



can be achieved. Casings are sturdily constructed and can be furnished hot-dip galvanized after fabrication. Fan wheels, housings, eliminators and discharge cowls can also be furnished hot galvanized after fabrication.

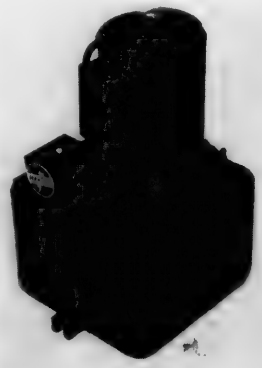
Coils can be arranged for thermal valve, flooded operation with surge drum and float, liquid recirculation and for either ammonia, freon and brine.

Air volumes run from 2500 to 28,000 cfm and tonnages (15 deg F), 5 to 30 tons.

More information? Circle Item 69, postcard, last page.

Steam Condensate Pump Unit

Hartell, Inc., Warminster, Pa., announces the addition of an automatic, vertical, steam condensate pump unit to its line of liquid handling devices. Known as Model SC-1 Centriflo, unit has been designed and developed for a maximum capacity of 1200 sq ft E.D.R. at 20 psi.



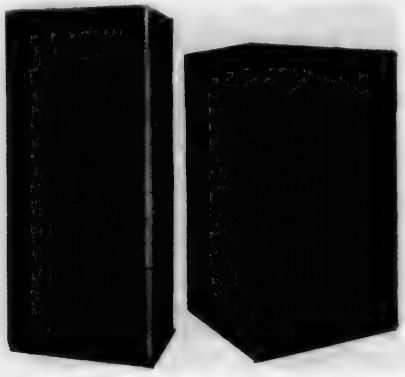
It is suited, the company reports, as an in-between size for the smaller steam installation for returning condensate flow to a collection point under pressure or gravity. Its compact size and light weight also make it suitable for installation where radiation has been added on to existing systems below the returns.

All material used is non-corrosive. Unit is completely factory assembled and tested prior to shipment.

More information? Circle Item 70, postcard, last page.

Commercial Packaged Conditioners

What the company describes as one of the most complete and versatile lines of commercial packaged air conditioning is announced by York Div., Borg-Warner Corp., York, Pa. The air-cooled Champion line has outside heat exhaust sections and a variety of inside evaporator sections.



An engineering feature of these units permits them to operate during cold weather periods. Six outside exhaust sections have capacities ranging from 4.7 to 15.7 tons. Two units have twin systems for step capacity control.

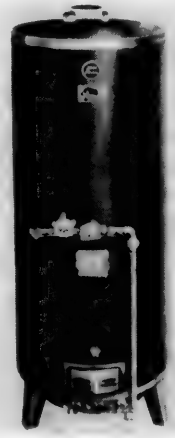
Inside coil sections are available in self-standing, ceiling-suspended, and direct-to-ductwork units. A line of plenum models is available for elimination of ductwork. Also, coils are available for direct application in ductwork, using existing blowers and ductwork.

Models in this series incorporate the company's cooling maze coils, twin multi-vaned blower wheels, extra-large receivers, and fully hermetic compressors.

More information? Circle Item 71, postcard, last page.

Automatic Gas Water Heaters

Heater and Tank Div., John Wood Co., Conshohocken, Pa., introduces a new line of Hi-Volume commercial automatic gas water heaters. Available in circulating or storage models, the heaters provide an unlimited supply of hot water for commercial, industrial and institutional use. These models are produced only with glass-lined tanks, assuring longer life and sparkling hot water.



Models HBG-65 and HBG-85 circulating type water heaters with multiple flue construction are designed for installations in conjunction with large storage tanks, where large quantities of hot water are required.

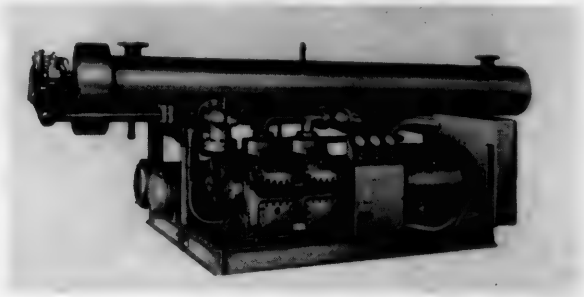
Models HSG-65 and HSG-85 storage type water heaters are designed for domestic and light commercial installations that have above-average hot water requirements. Two-temperature kits are available as optional equipment.

More information? Circle Item 72, postcard, last page.

Packaged Liquid Chillers

Availability of a completely new line of direct-drive and semi-hermetic packaged liquid chillers is announced by Curtis Manufacturing Co., St. Louis, Mo.

Sizes range from 75 through 125 hp in direct-drive compressors, and 7½ through 60 hp in semi-hermetic



compressors. All are designed for high-efficiency chilling of brines, glycol, oils, solvents, alcohol, kerosene, gasoline, drinking or processing water and other liquids.

Like the company's regular line of open-type reciprocating compressor units the new chillers provide economical answers to a wide variety of air conditioning, temperature and humidity control, and process cooling applications.

More information? Circle Item 73, postcard, last page.

Larger Phosphate Feeder

Greater convenience for water well owners in controlling waterborne mineral impurities which cause red water, lime scale, and corrosion is provided in the design of a new and larger phosphate feeder unit from Clayton Mark & Co., Evanston, Ill.

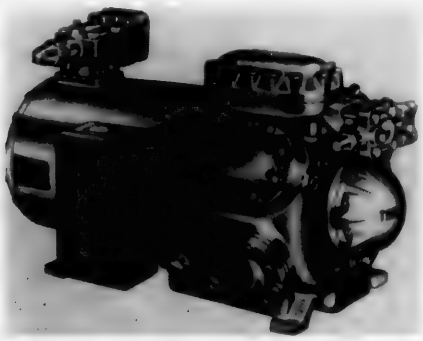
With a five-pound crystal capacity, two-thirds larger than previous models, the Mark 636 E-Z View feeder will operate automatically for a longer period than earlier feeders. Simplified and speedier refilling with poly-phosphate crystals is made possible by the unit's larger diameter top opening, permitting owners to pour crystals directly into the feeder from the can, instead of using a funnel.

Company has designed a compact, dual-purpose turn valve control for the unit. An easy turn of the lever-type handle shuts off water line pressure into the feeder, and at the same time permits water to bypass it.

More information? Circle Item 74, postcard, last page.

Hermetic Reciprocating Compressor

Development of hermetic models of its R-12 and R-22 reciprocating refrigeration compressor, used for all types of air conditioning applications, is announced by The Trane Co., La Crosse, Wis. Fabricated in two cylinder sizes, both sizes have been built into 4-, 5-, 6-, and 8-cylinder units. A smaller unit is also available with three cylinders. These nine compressors provide capacities from 10 to 100 tons.



Units have a one-piece motor-compressor housing instead of a split casing with a bolted joint between motor and compressor. This is said to prevent a variation in the gap between stator and rotor and to assure proper motor operation. Internal double thermostatic motor temperature protection is provided.

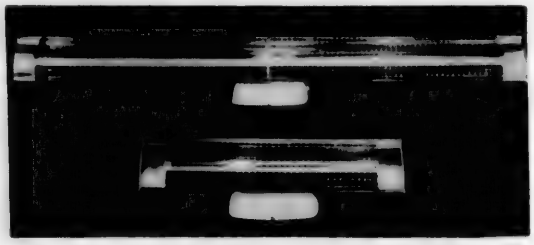
Compressor's staggered cylinder arrangement reduces over-all size. Operating at 1750 rpm, volumetric efficiency is 85% at 40 deg F suction and 105 deg condensing. A self-contained unloading system is built in, providing the capacity control to meet the wide fluctuations of air conditioning loads.

Other features include minimal danger from liquid slugging, oil-cleaning facility, foam breaker to prevent oil failure, aluminum alloy pistons and connecting rods for minimum weight and vibration, and accessibility for maintenance.

More information? Circle Item 75, postcard, last page.

Electric Radiant Heaters

Two heaters are added to its line of Infra-Safe infra-red radiant heating units by Hanovia Lamp Div., Engelhard Industries, Inc., Newark, N. J. They have 450 and 1500 wattage as compared to the 800-watt unit introduced last spring. Each is designed for both domestic and industrial purposes, can easily be installed on either wall or ceiling, and provides a high degree of comfort in heating a wide variety of areas ranging from bathrooms, basements, vestibules and patios to ticket offices, airline ramps, toll booths and motels.



Although the wattage is low, the company states, radiant heat is more direct and faster than convection or forced air heaters since it instantly warms persons and objects within its range.

Heaters will not give electrical shocks even if a metal object is inadvertently inserted because there are no exposed electrical parts. All parts are moisture resistant and will not be cracked or marred by water. Also, heaters emit no ultraviolet rays, so cannot cause sunburn. Heart of the unit is a quartz tube surrounding a resistor coil, backed by an infrared reflector. Covering the face of the heater is a decorative and protective grille plated with a 24-carat liquid gold which will neither tarnish nor oxidize.

Broadening of the Infra-Safe line was based on the company's decision to offer a choice in heaters for the accurate solution to "coldspot" heating problems. Model 30902 (450 watts) covers a 30-sq ft area, while Model 30903 (1500 watts) heats 90-sq ft. This compares to the 50-sq ft area served by Model 30900 (800 watts) introduced this past spring.

Width and height are 4½ inches for all three heaters and the overall length varies from 19½ inches for the smaller unit to 44½ inches on the larger heater.

More information? Circle Item 76, postcard, last page.

Diaphragm-Type Expansion Tank

A pressurized expansion tank said to eliminate boiler water air absorption into the system and subsequent waterlogging in the expansion tank is introduced by American Tube Products, Inc., West Warwick, R.I.

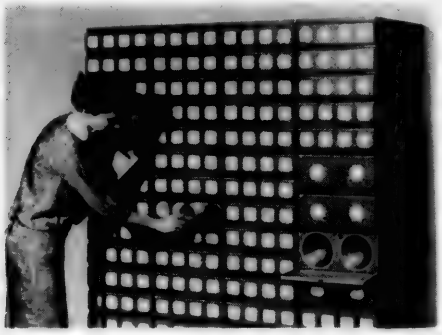
Marketed under the name American Ex-trol, tank prevents system water from coming into contact with the air cushion by means of a flexible diaphragm within the tank, creating a permanent barrier between the water and the cushion. The diaphragm is molded from a material compounded for high density and long life. Tank is charged and permanently sealed at the factory and requires no maintenance after installation, the manufacturer states.

Operating equally well in any number of locations in the hot water system, the tank, which may be installed in any attitude relative to the line, is fabricated from two pressed steel ASME-type steel heads, seam welded together, one fitting serving as both pipe connection and mounting provision. Because the air cushion is charged, the tank is smaller than the conventional expansion tank, affording convenience of installation.

More information? Circle Item 77, postcard, last page.

Plan File for Extra Large Rolls

Responding to demand by many users of Stack Files for a unit of greater capacity, Plan Hold Corp., South Gate, Calif., has introduced a new model. Whereas the original SRF unit has four tubes 2⅝ inches in diameter. the diameter of this new roll file unit has been increased to 4⅞-inch ID, and will be known as LRF.



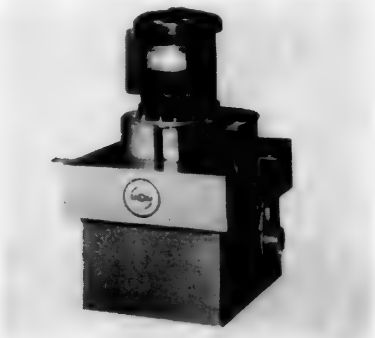
Like the basic SRF unit, the LRF has a furniture steel housing for 4 tubes, and is available in several sizes measuring from 2 to 5 feet in length. New unit retains the same 12½-inch width as the basic unit, but is 12 inches high. It can be stacked with basic units to form a single, rigid file (see photo). Finished in grey baked enamel, it makes an attractive and practical addition to any engineering office.

More information? Circle Item 78, postcard, last page.

Small Dust Collector

Described as a compact, low-cost industrial dust collector, Model 301, manufactured by Torit Mfg. Co., St. Paul, Minn., is designed for use in any light dust-producing operation.

Unit stands only 21½ inches high and occupies a 12 by 14-inch space. Because of its small size, it can be



conveniently located on or under work benches.

Dust-collecting medium is a highly-efficient, fire-resistant, throwaway glass filter. Performance ratings under standard test conditions are: 200 cfm; velocity, 4100; static pressure, 1.7 in. w.g.; inlet, 3 inches. Equipped with a ⅓-hp motor.

More information? Circle Item 79, postcard, last page.

Boiler Water Quality Control

The design of Filtrion Side-Stream boiler water quality control systems has been extended to service boilers operating up to 600 psi due to increased demand for high pressure installations, reports the manufacturer, Sparkler-Filtrion Corp., North Chicago, Ill.

These new models are sized for steam boilers up to 3000 hp. In line with higher pressure operation, these models feature control of boiler water silica content. They also provide automatic detection and control of soluble condensate contaminants, and positive filtration of insoluble contaminants such as suspended oils, fats and waxes, as well as corrosion products. Dissolved solids concentrations are constantly monitored and positively maintained at the most economical levels by a unique automatic blowdown system. All boiler and feedwater control systems are complete, automated packaged units.

More information? Circle Item 80, postcard, last page.

Expands Package Chiller Line

Packaged water chillers of 100-ton and 125-ton capacities have been added to the compact HE Flow Therm models offered for medium and large commercial air conditioning installations or industrial process applications by Acme Industries, Inc., Jackson, Mich.

Addition of the 100-ton and 125-ton factory-assembled packaged water chillers brings to eight the number of HE Flow Therm models offered by Acme. Ratings of the models in tons capacity now are 20, 25, 30, 40, 50, 60, 100 and 125.

Acme, manufacturer of air conditioning and refrigeration systems since 1919, unveiled the ready-to-install water coolers late in 1958. Through the use of matched components and engineering efficiencies both the size and weight of the packaged units have been reduced about 50 percent while performance has been increased. Cost economies also have been effected.

Overall length of the HE-125 is less than 9 feet; it is 42 inches wide and 66¼ inches high. Operating weight is 5,350 pounds.

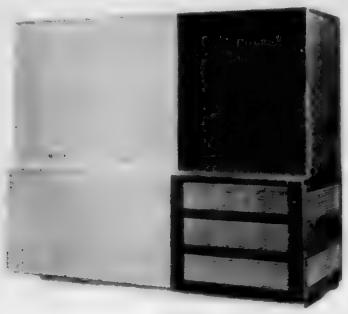
The HE-100 is less than 90 inches long overall, 42 inches wide and 66¼ inches high. Its operating weight is 4,350 pounds.

More information? Circle Item 81, postcard, last page.

Direct-Fired Heating-Cooling Unit

Arkla Air Conditioning Corp., Little Rock, Ark., unveiled its new direct-fired 25-ton gas absorption cooling-heating unit at the 2nd Southwest Heating and Air Conditioning Exposition and ASHRAE meeting in Dallas, Tex.

Instead of using steam to boil the refrigerant-absorbent solution (water-lithium bromide, same as in the steam models), Model DF-3000 utilizes a unique and highly efficient type of generator in which a bank of 30 individual



burners, firing horizontally down tubes in the generator section, boils solution around them. From this point on—after the solution is carried to the separator and the refrigerant vapor proceeds to the condenser—the operation on the cooling cycle is essentially the same as that of steam units. Heating is produced by shutting off the condensing water, causing what would be hot refrigerant vapor on cooling to enter the evaporator directly. Thus the secondary circulating water is heated to temperatures up to 170 deg F.

As in other Arkla absorption models, this "sealed system" exchanger operates without any mechanical purge or circulating pumps or compressors. The no-moving-parts design and near-frictionless operation offer long, permanent-efficiency service life and freedom from vibration, the company reports. With low floor loading per ton, the DF-3000 can be installed in almost any location.

More information? Circle Item 82, postcard, last page.

Light Control Starts Conditioners

A compact, automatic electronic switch, called Lightguard, normally used to turn lights on at dusk and off at dawn, can be operated in reverse, through a relay, to turn on an air conditioning system or group of window units, states the manufacturer, Schacht Electronic Mfg. Co., Houston, Tex. Thus, plants and offices could start air conditioning systems early in the morning to precool premises before arrival of employees.

In midsummer, when hottest weather can be expected, it normally begins to get light about 5 a.m. As soon as the light striking the photo-electronic unit reaches the level of 10 foot-candles, the switch operates, starting the air conditioning system. If properly located, where it is exposed to unobstructed light from the north sky, there is no danger of it turning the system off during cloudy periods during the day, the company states. In early fall, when the weather is cooler the unit turns on the air conditioning later, in accordance with later sunrise time.

The plan is said to be particularly effective in offices where there are several window air conditioners. A contactor, of the mercury plunger type, will be required ahead of the window-unit multi-breaker panel. This contactor will be controlled by the photo-electronic switch through its relay.

It is easy to install the compact unit unobstrusively, even on the front of a downtown office building. It can be installed in a recessed outlet box, no larger than the standard switch-box type used for weatherproof receptacles. Or it could be concealed in the top of a bracket fixture at the front entry. In this location it could do double duty, turning the light on at dusk and off at dawn, and starting the air conditioning system through a mercury-plunger relay at dawn.

Other provisions will have to be made for Sundays and for turnoff of the air conditioning system at the close of the working day. For this a light-duty seven-day time clock will be required, operating in conjunction with the photo-electronic switch to control the air conditioning system.

The switch might also have application in zoned air conditioning systems. It could be used to anticipate heat transmission loads on the outside wall of a building when the sun first strikes the wall.

More information? Circle Item 83, postcard, last page.

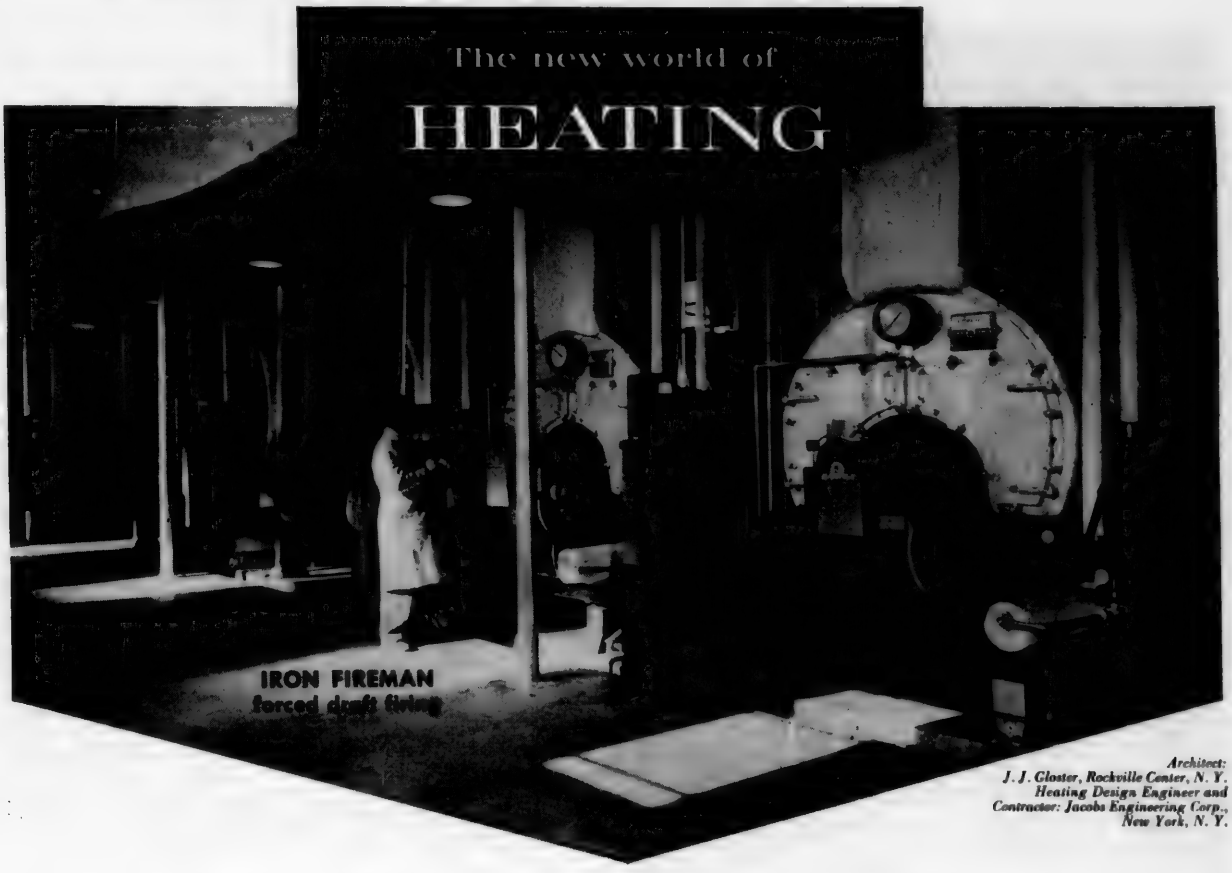
Wall-Mounted Coffee Bar

Addition of a wall-mounted Coffee Bar to its line of wall-mounted coolers is announced by Halsey W. Taylor Co., Warren, Ohio. It provides instantaneous 180-deg F hot water and will serve sixty 8-oz cups of coffee per hour.

There are no exposed fittings, all plumbing connections entering cabinet directly from the wall; takes no floor space, and is available in 6-, 11-, and 16-gal capacities, each provided with two-stream, mound-building projector and with anti-squirt feature. Said to meet all health standards and sanitary provisions.

More information? Circle Item 84, postcard, last page.

(Continued on page 118)



Architect:
J. J. Gloster, Rockville Center, N. Y.
Heating Design Engineer and Contractor: Jacobs Engineering Corp., New York, N. Y.

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says Mr. Fred Reidel, Chief Engineer, Mid-Island Hospital, Bethpage, L. I.

"The old-fashioned way of installing boilers," says Mr. Reidel, "required that we get separate estimates for burners, steel front plate, brick combustion chamber, oil heating equipment and wiring. Everything was assembled at the site. Now the finished unit is simply lowered into place and bolted down."

A single contract not only keeps your installation costs under control, but greatly reduces these costs as well. It also narrows responsibility for the proper installation and functioning of the equipment.

Easy to size and specify. After determining the required load and deciding on the fuel (gas, oil or dual-fuel combination), it is only necessary to refer to a chart to find the correct size of unit, or units, for your job.

Multiple units have many advantages. You can have a tailor-made plant with low initial cost. A stand-by unit protects you against emergencies or peak loads. You can split your plant between high and low pressure boilers to meet special needs, or between steam and hot water units. Capacities range from 10 to 650 boiler horsepower.

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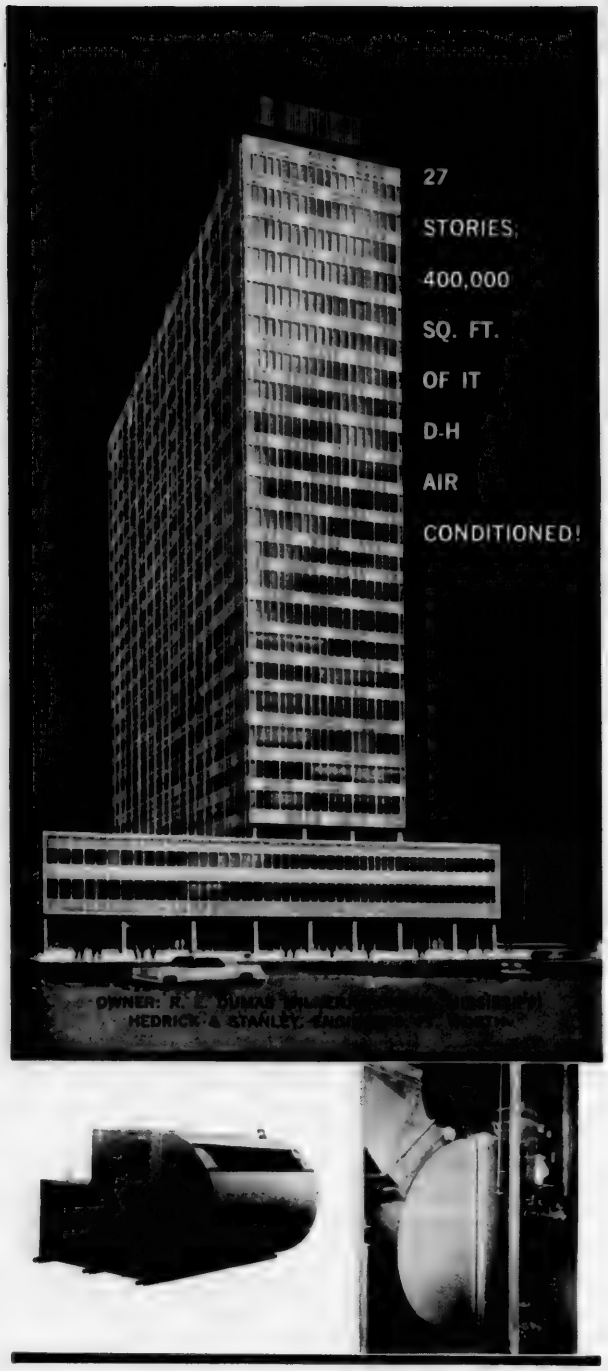

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(Continued from page 116)

Two-Wire Submersible Pump Motor

A two-wire oil-filled submersible pump motor, first to be offered to the pump industry by a motor manufacturer, is announced by General Electric Co., Schenectady, N. Y.

Permanent-split capacitor motor is designed for submersible pumps used in four-inch or larger well applications. It is available in ratings from ⅓ through 1½ hp. Major feature of the motor is the capacitor built inside the motor eliminating the need for a control panel outside the well. Inherently quiet in design, this two-wire motor eliminates chances for error during installation.

Construction of the motor is such that the oil reservoir is held under constant compression by a heavy-duty steel spring, maintaining positive internal pressure of oil to keep water out. Heavy steel housing is specially treated for maximum protection against corrosion; also protects oil reservoir from damage during shipment and installation.

More information? Circle Item 85, postcard, last page.

Dual-Range Manometer

A dual-range manometer that can be used either as a vertical U-tube manometer or as an inclined manometer in the measurement of low pressures is offered by F. W. Dwyer Mfg. Co., Michigan City, Ind. A special scale allows reading high-range measurements on the other leg when gage is inclined.

When used as a U-tube manometer, pressures or pressure differentials are measured from 0 to 16″ of water with minor scale divisions of .2″ water. As an inclined gage, the Dual Range Manometer reads from .20″ to 0 to 2.60″ of water with minor scale divisions of .02″. A simple, foolproof method of setting the manometer to zero on the inclined scale eliminates the need for a spirit level to determine the correct angle of inclination.

More information? Circle Item 86, postcard, last page.

(Continued on page 120)

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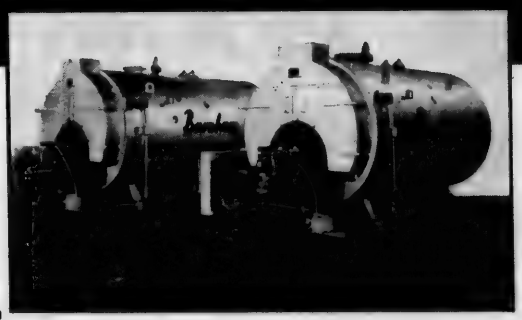
THE OREOLE REFRIGERATION CO.	*Mechanical Contractors, Baltimore, Md.*



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Designed with the active collaboration of the world-famous architect, Dr. Walter Gropius, the Oheb Shalom Temple is outstanding in every way.

As in many other structures where quality is demanded, Burnham heating was chosen. Two Burnham Packaged Scotch-Type Boilers with complete oil-fired forced-draft combustion units were selected. Each has a certified water rating of 2,625 MBh.

Stock sizes in these Packaged Scotch-Type Boilers range in capacity from 2,930 to 39,370 sq. ft. net E.D.R. steam, new SBI ratings or net steam or water 702 MBh to 9,450 MBh. They give you an important advantage . . . a perfectly matched combination of boiler and burner for heavy oil, light oil, or oil/gas combination. Standard models with up to 4,000 sq. ft. of heating surface can also be supplied when specified.

Also available for prompt shipment: Compact Type Table 1 and Table 2 steel boilers

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THERE ARE DEFINITE STANDARDS which Air Engineers follow in recommending the filter for your requirements. Write today for details and information.

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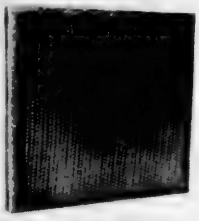
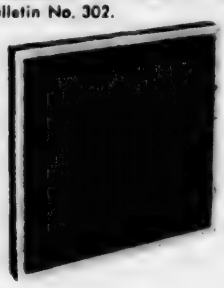


AIR FILTERS (Low Velocity)
Viscous impingement type, permanent and cleanable — designed for industrial, commercial and domestic use. Available in 1" and 2" thickness. Bulletin No. 302.



VIRO-CRIMP (High Velocity)
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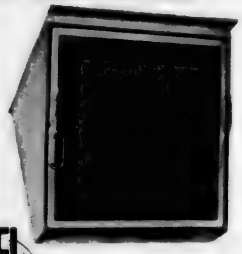

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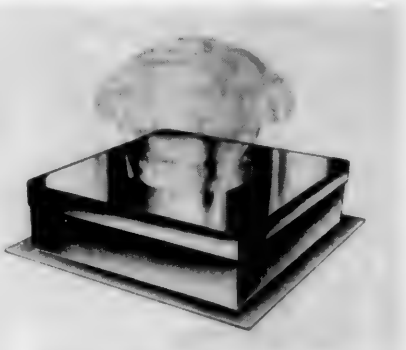
(Continued from page 118)

Sound Control Curb

A sound control curb that combines effective noise attenuation with negligible loss of air flow is introduced by Jenn-Air Products Co., Inc., Indianapolis, Ind.

Called Jenn-Air QT sound control curb, the attenuator is a prefabricated, self-flashing curb only 6 to 12 inches in overall height. Independent laboratory tests show that it absorbs more than 90% of an exhauster's sound power



at inlet. This is equal to the noise absorbed by 18 feet of 14-inch square duct, lined throughout with one inch of glass fiber (6-lb density). According to the manufacturer, use of this curb will permit direct overhead ventilation in classrooms, conference rooms, sound studios and other installations where noise suppression is a critical factor.

Despite its effective attenuating ability, the sound control curb cuts air flow capacity by only 10%. A unit rated at 1640 cfm, for example, will deliver 1476 cfm when mounted on the QT curb.

Attenuator is thermo-insulated to prevent condensation. As easily installed as a conventional curb, it can be mounted directly at the roof line, or installed into the roof when lower contour is desired. Four sizes are available, with or without cant strip.

More information? Circle Item 87, postcard, last page.

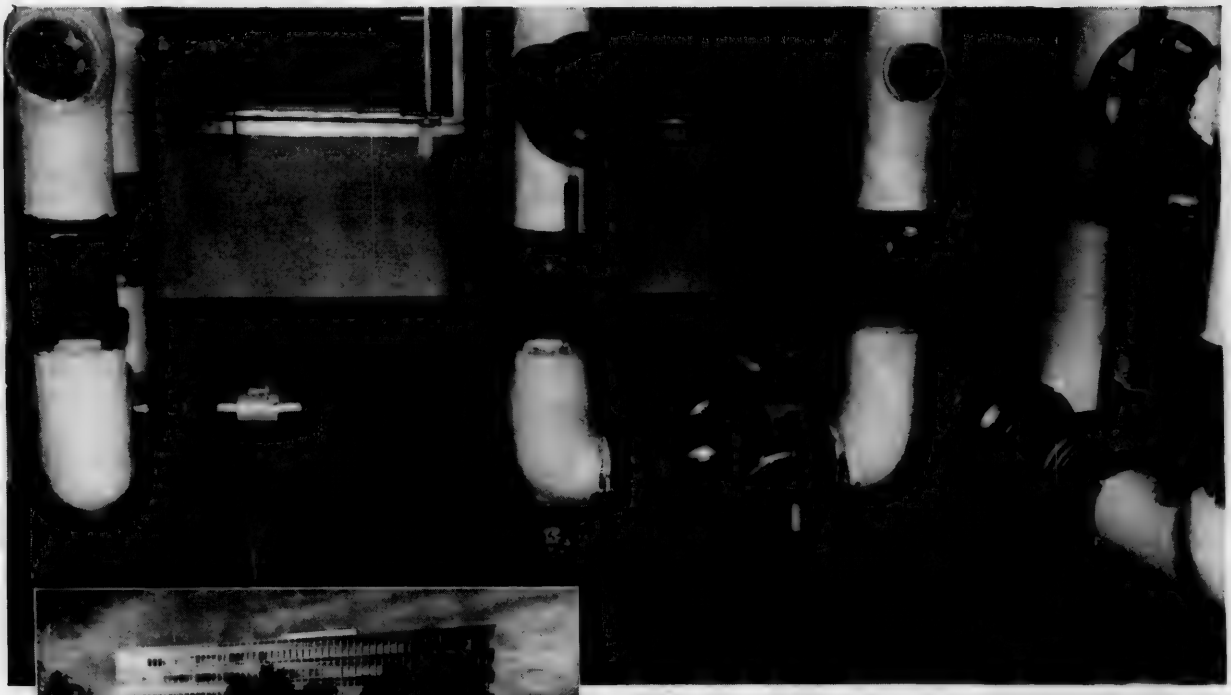
Activated Charcoal Paint

Activated charcoal, long famous for its ability to remove gases and odors from the air, is now available in an entirely new form—paint. Developed by Barnebey-Cheney Co., Columbus, Ohio, charcoal paint is made from high grade, finely powdered activated coconut shell charcoal with a binding agent which gives good film properties and a minimum of interference with the adsorptive properties of the charcoal.

The paint can be coated on metal, concrete, stone, plastic, wood, fiber or paper surfaces. It can be used to give odor adsorptive properties to containers, rooms, buildings, fabrics, and various types of filter construction. Called X-21, paint is furnished in concentrated form in one quart, one gallon, and five gallon containers.

More information? Circle Item 88, postcard, last page.

(Continued on page 122)



Washington Water Power Building, Spokane, Wash. and one of the pumping stations.

Architects: Kenneth W. Brooks, A.I.A.
Bruce M. Walker, A.I.A.
Mechanical Engineer: Wood & Landerholm
J. Donald Kroeker & Associates—Consultant
Mechanical Contractors: Warren, Little & Lund, Inc.

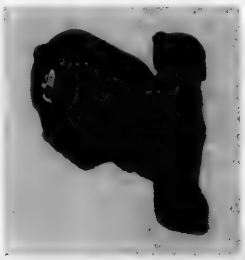
WORLD'S THIRD LARGEST HEAT PUMP INSTALLATION EQUIPPED WITH B&G® PUMPS

In this modern building, the third largest heat pump installation in the world provides 815 tons of refrigeration and 9,000,000 BTU for heating. The heat pump draws 1600 GPM from a deep well with the water being discharged to the river in winter and used for irrigation in the summer.

The heating and cooling system is a dual duct, high velocity system, with a separate zone and pumping station on each floor. Five B&G Universal pumps and 21 B&G Boosters provide the necessary circulating equipment.

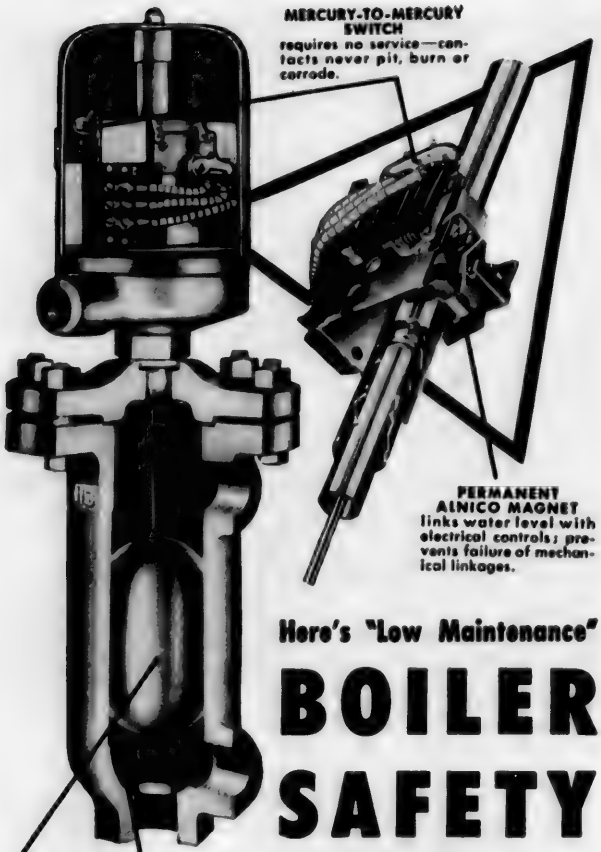
The system employs the Primary and Secondary Method of Pumping developed by B&G engineers. This method materially reduces pump horsepower required and provides close temperature control, more comfort, lower operating and installation costs.

Send for free booklet on B&G System of Primary and Secondary Pumping.



B&G Universal and Booster Pumps are specially designed and built for systems using water for heating and cooling. They are distinguished by quiet, vibrationless operation and long failure-proof operation. They can be installed without flexible connectors or noise dampeners of any kind.

BELL & GOSSETT
COMPANY
Dept GC-4, Morton Grove, Ill.
Canadian Licensee: S.A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario


MERCURY-TO-MERCURY SWITCH
requires no service—contacts never pit, burn or corrode.
PERMANENT ALNICO MAGNET
links water level with electrical controls; prevents failure of mechanical linkages.
CORROSION-RESISTANT FLOAT
is made of 304 Stainless Steel for long, trouble-free service. Can also be made of special materials for extreme local conditions.
NO-SCALE FLOAT CHAMBER LINER
"flexes" off scale; prevents float "sticking".

Here's "Low Maintenance"

BOILER SAFETY

MAGNETROL

BOILER WATER LEVEL CONTROLS

"Blow-down" the float chamber once-a-shift; inspect the switches once a month—that's all you have to do to keep a Magnetrol in tip-top *safe shape.* It's made that way. The secret is all in the simple magnetic operating principle *as pioneered and perfected by Magnetrol.*

A magnetic sleeve, raised and lowered within a nonmagnetic tube, attracts or repels an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

Standard Magnetrol Units are available for pressures to 600 psi and temperatures to 750°F., for single or multi-stage control with as many as three separate switching actions. Also special units for more extreme requirements. For full details, mail coupon.

MAGNETROL, Inc.

MAGNETROL, INC., 2106 S. Marshall Blvd., Chicago 23, Ill.
Please send Catalog Section III with full information about Magnetrol Boiler Water Level Controls. 10

Name_____

Company_____

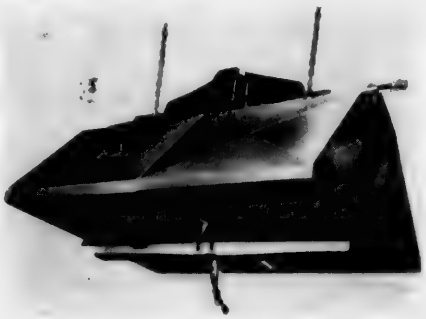
Address_____

City_____ Zone____ State_____

(Continued from page 120)

Hooded Infra-Red Gas Heater

Development of a hooded gas-fired infra-red generator is announced by Panelbloc Div., Bettcher Mfg. Corp., Cleveland, Ohio. Heaters are available in two sizes: Model CRH-63, with 62,500 Btu input; and Model CRH-125, with 125,000 Btu input.



Hooded units feature a bright aluminum hood, which replaces the customary louvers. Design of the hood is such that it concentrates the heater output into a denser radiant beam. This concentration, in turn, permits higher mounting height. Thus, units may be hung 7 ft higher than the standard model, and still cover approximately the same area, with the same radiation intensity on the floor as the louvered heater.

Heaters will continue to utilize self-energizing controls, so that hanging, piping, and flue connections are all that is required to complete installation. Electrical connections are not necessary. Heaters have been AGA approved for all commercially available gases.

More information? Circle Item 89, postcard, last page.

Baseboard Provides for Expansion

Embassy Steel Products, Inc., Brooklyn, N.Y., announces a new ¾-inch hydronic baseboard, called Panel-Track. Baseboard element has four expansion tracks interlocked to the corners of each fin, providing "full

free-flow expansion." No clips or slide cradle devices are required.

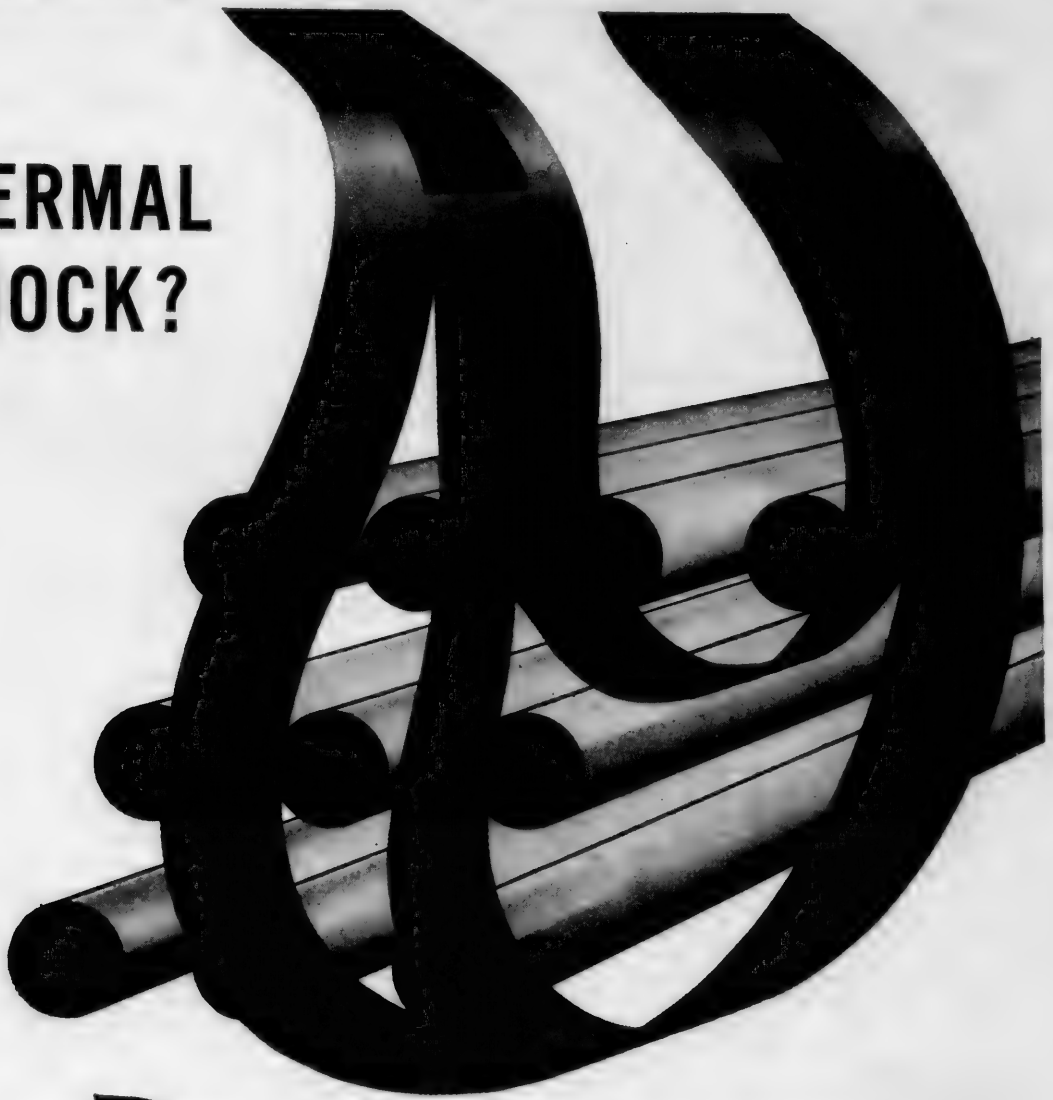
Available in lengths from 2 through 20 ft, in one-foot increments, the baseboard is reported by the manufacturer to be exceptionally easy to install.

More information? Circle Item 90, postcard, last page.

(Concluded on page 124)

FROM THE WORLD LEADER IN PACKAGED AUTOMATIC BOILERS...

THERMAL SHOCK?

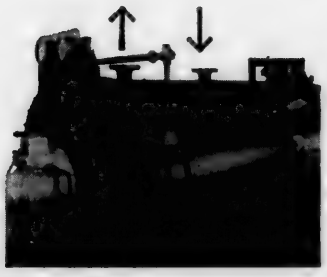


...NOT WITH *Powermaster*® HOT WATER BOILERS

Here's "years ahead design" specifically engineered for modern forced circulation heating applications. Thermal shock, a result of a rapid change in temperature differentials, is held to the barest minimum for these reasons: 1. The top inlet with specially designed internal distributor directs incoming water down around sides of boiler for full-flow heating; 2. Internal distribution prevents direct flow of return water against heating surfaces; 3. Outlet is of dip tube design located at top of boiler; 4. Temperature gradients are kept lower than in any other packaged automatic boiler.

Add to this the outstanding performance of *Powermaster's* high firing efficiency at all loads . . . from 20% to 100% of full firing rate, and you have an unbeatable package to supply the most advanced heating applications in the 20 to 600 hp range. Don't settle for anything less.

For complete details call your local O&S representative or write for Bulletin 1251.



75th

ORR & SEMBOWER, INC.

980 Morgantown Road
Reading, Pa. • Since 1885

This man is balancing an air flow system for the first and last time

No call backs to correct hot or cold spots when the system is set up right the first time with an

Alnor VELOMETER®

Instant reading of air flow, in feet per minute, at outlets and draw of air at returns gives an accurate check on engineered systems. The Velometer has a range from 20 f.p.m. to 3000 f.p.m. or 6000 f.p.m.

The Velometer will also give direct readings of static pressure in ducts, plenum chambers, or pipes. Registers pressure loss across heater and filters, friction loss at ells and deflectors. Many government and municipal jobs require Velometer checking before acceptance. Every air heating and air conditioning engineer on the job can save time and be sure of peak efficiency of the system by Velometer testing.

Velometer No. 3G

The Velometer, set No. 3G recommended for commercial heating and air conditioning, is priced at only $194.00 including a sturdy reinforced carrying case. Bulletin No. 2448 gives complete operating facts and various types of jets and accessories.

Alnor INSTRUMENTS

PYROMETERS — VELOMETERS — DEWPOINTERS

Illinois Testing Laboratories Inc.
Chicago 10, Ill.

Illinois Testing Laboratories Inc.,
Room 570, 420 N. LaSalle St., Chicago 10, Ill.
Please send Velometer Bulletin 2448.

Name_____

Company_____

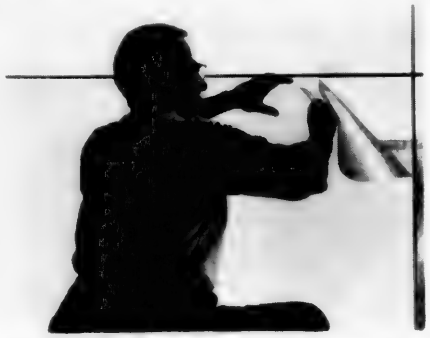
Address_____

City_____ Zone____ State_____

(Concluded from page 122)

Heat-Reducing Vinyl Sheeting

An economical method of eliminating glare and heat through use of a special vinyl sheeting called Tox-Shade is available for windows ranging in sizes up to 48 x 72 inches from Toch Brothers, Division of Standard-Toch Chemicals, Inc., Staten Island, N. Y.



Said to be highly durable, vinyl sheeting effectively screens out glare in work areas and prevents excessive temperature build-up from direct exposure to sunlight. It is said to be more economical than window shades or venetian blinds, without the maintenance and replacement normally required by these dust collectors.

Available in several transparent, translucent and opaque colors, sheeting is furnished custom cut to exact window dimensions. It is applied without adhesive by squeegeeing to the pane of glass, producing a perfect bond that will last as long as required. Stripping from the window, too, is a matter of seconds, making seasonal storage possible. In spite of severe extremes of heat or cold, it will maintain its original bond and does not become brittle. It is as washable as glass itself.

More information? Circle Item 91, postcard, last page.

I-B-R Approved Finned Radiation

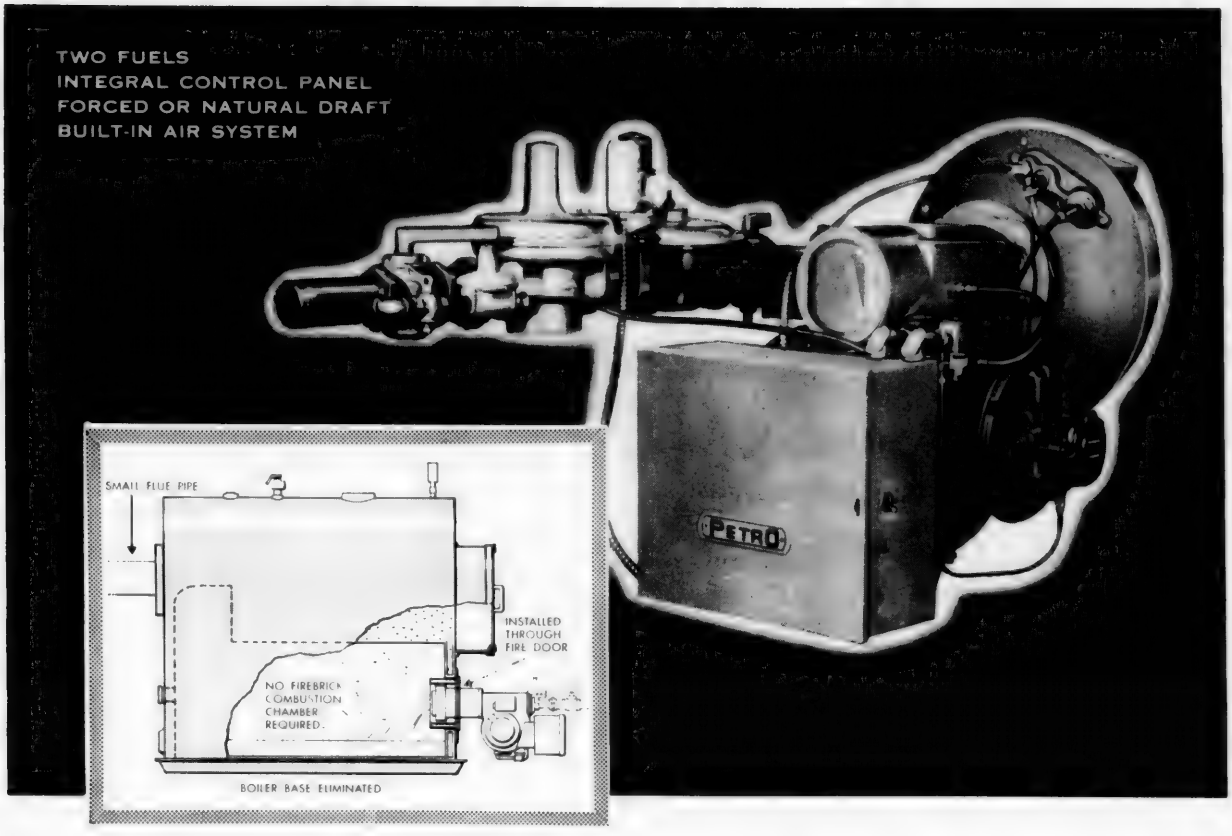
The Institute of Boiler and Radiator Manufacturers announces the approval of I-B-R ratings for commercial finned tube radiation, which have been confirmed by check testing at the I-B-R laboratory at Urbana, Ill., under the Third Edition of the I-B-R Finned Tube Code for certain units sold by the following companies:

Crane Co., Dunham Bush, Inc., Edwards Engineering Corp., Kritzer Radiant Coils, Inc., Modine Manufacturing Co., National-U.S. Radiator Corp., John J. Nesbitt, Inc., Radiant-Ray Radiation, Inc., Sterling Radiator Co., Inc., The Vulcan Radiator Co., and Warren Webster and Co. Ratings for other manufacturers are in the process of check testing.

Requests for details of units and approved ratings should be addressed to The Institute at 608 Fifth Avenue, New York 20, N. Y. The Institute will also answer inquiries regarding the status of I-B-R finned tube ratings as applied to manufacturers not listed above.

The I-B-R Laboratory was built in 1957 for the purpose, now accomplished, of confirming the accuracy of ratings on baseboards and commercial finned radiation.

New all-in-one burner *bolts to boiler front*



Average installation saving in firebox boilers: $250

Substantial savings in installation costs are made possible in a firebox boiler by the elimination of the boiler base and fire brick combustion chamber. Fits any boiler; bolts to the boiler front. Complete forced draft, fuel and control systems are built into the burner. No secondary air construction needed.

Also available as boiler-burner unit

Packaged boiler with integral burner can be delivered at site, ready for service connections. No brickwork, pit, or special setting required.

No high stack needed

In a sealed fire box no stack is required; merely a vent. Air is supplied under forced draft. In conventional boilers the stack can be shorter and smaller than required by the usual gas or oil burner.

Switches fuels instantly

Burns either fuel with high efficiency. Saves purchase of extra burner in areas where gas users must provide standby oil equipment. One-fuel models are also available for either gas or oil.

Cuts fuel costs

New type of burner head and improved fuel-air control develops exceptional combustion efficiency. Instant heat absorption. No wasteful refractories to heat up.

Costs less to operate

Requires no more supervision than a domestic burner. Maintenance problems are negligible, and can usually be handled by the janitor.

Capacities: oil, 4 to 30 gph; gas, 500,000 to 4,000,000 btu/h.

Send coupon for full description and specifications

Makers of Quality Heating and Power Equipment since 1903

PETRO

T. M. REG. U. S. PAT. OFF

PETRO, 3217 W. 106th Street, Cleveland 11, Ohio
(In Canada: 80 Ward Street, Toronto, Ontario)

Please send complete information on Petro P-240 dual-fuel burner and boiler-burner units.

Name.....

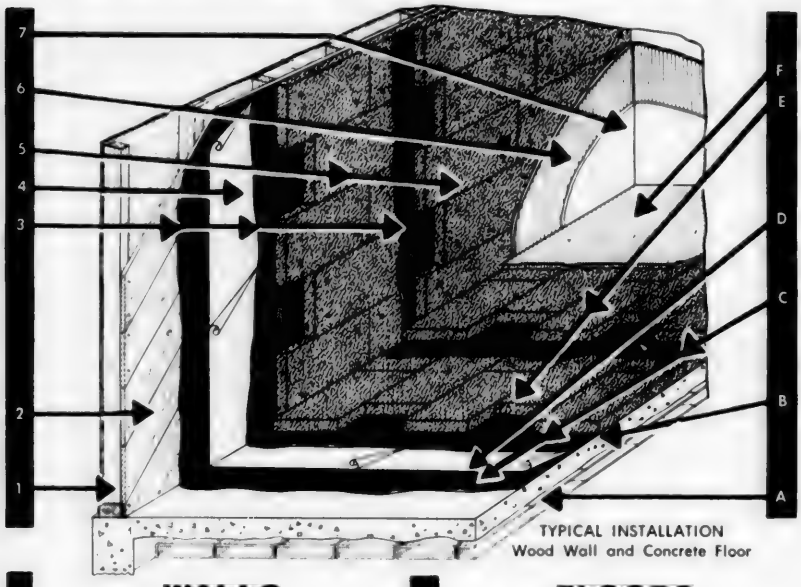
Company.....

Address.....

City.....State.....

1950: True Then—

In 1950 we published this cutaway drawing to illustrate the *best way* to handle typical cold-storage construction.



TYPICAL INSTALLATION
Wood Wall and Concrete Floor

WALLS

1. **WOOD STUDS**
2. **WOOD SHEATHING**
3. **LAYKOLD INSULATION ADHESIVE** Brush or spray at 23 sq. ft. per gallon. Allow to set (turn black) then press on membrane or blocks
4. **VAPOR BARRIER MEMBRANE** Press into adhesive. Use 3" laps; 1 to 3 layers.
5. **INSULATION BLOCKS** When first layer has been placed, set skewers and repeat for next layer of insulation.
6. **LAYKOLD MASTIC WEATHERCOAT** Point joints and trowel scratch coat at 8 sq. ft. per gallon. Let dry.
7. **LAYKOLD WEATHERCOAT** Trowel at 15 sq. ft. per gallon for water-resistant finish.

FLOORS

A. **TILE OR GRAVEL FILL** For ventilation vs. freezing of the sub-grade.

B. **CONCRETE SUB-SLAB** If new, use Hydropel integral admix at 1½ gallons per sack of cement. Gives a dry slab.

C. **LAYKOLD INSULATION ADHESIVE** Spray, brush or squeegee at 23 sq. ft. per gallon. Let set (turn black). Then press on membrane and block insulation.

D. **VAPOR BARRIER MEMBRANE** Press into the adhesive. Use 3" laps—1 to 3 layers.

E. **INSULATION BLOCKS**

F. **2" LAYKOLD HEAVY DUTY FLOOR MASTIC**

Still True Today—

Laykold asphalts have a *history of performance* in the cold-storage construction field. They have *even more promise* in the future. This same procedure will be used on thousands of jobs in the years ahead!

If you do not have all the facts on the Laykold line of products listed below, call our nearest office today!

- **Laykold Insulation Adhesive**
- **Laykold Weathercoat**
- **Laykold Mastic Weathercoat**
- **Laykold Floor Mastic Binder**

American Bitumuls & Asphalt Company

320 MARKET, SAN FRANCISCO 20, CALIF.
Perth Amboy, N. J.
Baltimore 3, Md.
Cincinnati 38, Ohio
Atlanta 8, Ga.
Mobile, Ala.
St. Louis 17, Mo.
Tucson, Ariz.
Portland 8, Ore.
Oakland 1, Calif.
Inglewood, Calif.
San Juan 23, P. R.

BITUMULS® Emulsified Asphalts • CHEVRON® Paving Asphalts • LAYKOLD® Asphalt Specialties • PETROLASTIC® Industrial Asphalts

WESTERN SHOW

(Continued from page 10)

a panel discussion on *high velocity ducting.*

On April 29 a temperature control clinic will be held between 2:30 and 4:00 p.m. with E. L. Nelson of Union Ice Company as chairman. Members of Johnson Service, Minneapolis-Honeywell, Powers Regulator, and Barber-Coleman Companies will participate.

A symposium on *piping* with Henry Ulovec of Mehring & Hanson Co. in the chair will be held between 6:30 and 8:00 p.m. Leading authorities on this subject will present papers.

On April 30 the program will consist of a specification clinic with Chester D. Walz, consulting engineer, moderating the discussion between a contractor, a material man and an architect.

Lighting Loads in Office Building will be the topic of a technical talk by Cary B. Gamble, consulting engineer, between 2:00 and 3:00 p.m., and from 3:00 to 4:00 p.m. Arthur J. Hess will discuss *hospital air conditioning.*

Exhibit information, registration applications and all further details may be obtained by writing Fred J. Tabery, Exhibit and Conference, 3443 South Hill Street, Los Angeles 7, Calif.

FROM $2,000 to $40,000,000 IN THIRTY YEARS OF GROWTH

General Controls Company was founded thirty years ago in an Oakland, California, loft by William A. Ray and his three brothers, A. W., J. F., and R. G. The initial capital was $10,000 borrowed from their father, William R. Ray, head of Ray Oil Burner Company. Sales the first year amounted to $2,000; the sales rate today is over $40 million a year.

William A. Ray is and has been president and director of engineering since the company was founded. He also became chairman of the board after the death of his father. He is the holder of more

(Continued on page 128)

23rd NATIONAL

OIL HEAT and AIR CONDITIONING EXPOSITION

NEW YORK CITY COLISEUM APRIL 4·5·6·7
SHOW HOURS 1 to 9 P.M. DAILY

the key to your future is in this

TREASURE HOUSE OF IDEAS!!!!

You are at the dawn of an entirely new era. Dawn will break April 4-7 at the industries' Trade Exposition, presenting a glittering array of new ideas and new equipment . . . opening up a whole new range of opportunities for you. In the history of this event—there's never been so much that's really new and important. Join the 12,000-15,000 leading industry people who make certain they attend this show seeking dramatic new products . . . new methods . . . new systems . . . new ways to save and make money. *Admission free to industry people.* (Some exhibit space still available.)

SPECIAL SESSIONS AT COLISEUM FOR CONTRACTORS AND DEALERS By request two sessions will be conducted on the mezzanine. Subject: *"How to Meet Electric Heat Competition";* 3 to 5 p.m. Wednesday, April 6 *for plumbing and heating contractors;* 3 to 5:30 p.m. Thursday, April 7 *for warm air heating and air conditioning contractors.*

MAKE YOUR HOTEL RESERVATION NOW Write O.H.I. Housing Bureau, c/o New York Convention and Visitors Bureau, 90 E. 42nd Street, New York 17, N. Y. for accommodations. Why not bring your wife too?

SPONSORED BY

OIL HEAT INSTITUTE OF AMERICA, Inc.
500 FIFTH AVE. NEW YORK 36, N.Y. LOngacre 4-3755

OIL HEAT'S DIAMOND JUBILEE
1885 - 1960
75 YEARS OF CABINET COMFORT

38th Annual OHI CONVENTION

Park Sheraton Hotel -- April 4 • 5 • 6 • 7

You're welcome to another Treasure House of Ideas At these Convention Sessions

MONDAY, APRIL 4
OHI Business Meetings

TUESDAY, APRIL 5
4th Technical Division Symposium

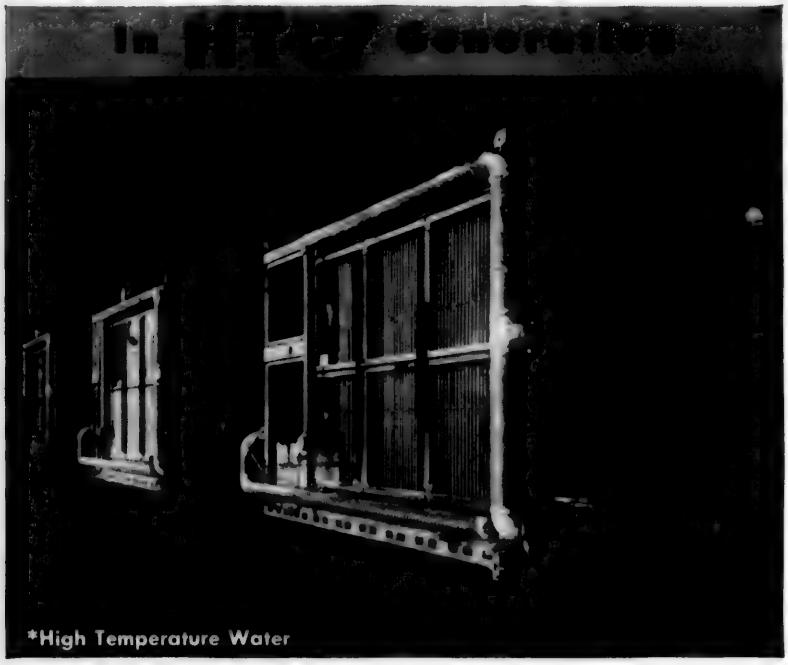
WEDNESDAY, APRIL 6
1st Distribution Division Sales Building Business Rally
Grand Diamond Jubilee Convention Luncheon

THURSDAY, APRIL 7
2nd Distribution Division Sales Building Business Rally

Commercial-Industrial Meetings
All four days for dealers, installers, contractors and manufacturers . . . presenting new approaches to commercial-industrial problems.

Advance Registration to Convention
Send registration check—$5—to Oil-Heat Institute of America, Inc.
Ask for literature.

MEET the LEADERS of the INDUSTRY in New York



International-LaMont LEADS THE WAY

TYPICAL INSTALLATIONS

INDUSTRIAL & COMMERCIAL
Douglas Aircraft Corp.
Continental Can Co.
Union Carbide Nuclear Co.
Buhr-Manning Co.
Johnson & Johnson
American Airlines Inc.
Bethlehem Steel Co.
New York International Airport
Ohio National Life Insurance Co.
Trans-Canada Air Lines
Bethlehem Pacific Coast Steel Co.
International Min. & Chem. Corp.

HOSPITALS
N. E. Florida Mental Hospital, Fla.
The Children's Hospital, Ohio
Bronx State Hospital, N. Y.
Loring AFB Hospital, Me.
Hadassah-Hebrew Medical Center, Israel

SCHOOLS & UNIVERSITIES
Rutgers University, N. J.
Hilltop Elem. School, Ohio
American River Jr. College, Cal.
Madeira High School, Ohio
Brigham Young University, Utah
Indian Hill Elem. School, Ohio
Holy Apostles School, Wisc.
Maple Park Elem. School, Ohio
Everett High School, Mich.
Avondale Elem. School, Ohio
Utica Jr. High School, Mich.
Whitewater High School, Wisc.
College of Great Falls, Mont.
The Colorado College, Colo.
St. Joseph Seminary, La.
Blossom Hill School, Ohio
Plus 21 U. S. Air Force and Navy Bases.

More than 130 International-LaMont High Temperature Water Generators already in operation have a total capacity exceeding THREE BILLION Btu/hr.

This unequalled acceptance underlines a significant point. It is not enough merely to heat and distribute water at temperatures to 430° F. or more. The *real* economy of HTW is in the *magnitude* of the temperature differential between boiler discharge and return water.

Making full use of the proven LaMont principles of forced recirculation, International-LaMont Generators permit temperature differentials to 200° F. or more with *no danger of thermal shock*. Here is the key to major capital and operational savings throughout the system. In addition, International-LaMont counterflow design assures optimum heat absorption and high operating efficiency.

Investigate the *true* economy of high temperature water in terms of International-LaMont Forced Recirculation Generators.

Get full details from your
INTERNATIONAL DISTRICT REPRESENTATIVE
or write for Bulletins 700 and 1000 today.

IBW BOILER BUILDERS SINCE 1886

THE INTERNATIONAL BOILER WORKS CO.

Steel Firebox Heating & Power Boilers
Low & High Pressure Water Tube Package Boilers • International-LaMont Forced Recirculation Generators • ASME Code Pressure Vessels & Welded Products.

890 Spruce St. East Stroudsburg, Pa.

Manufactured and sold in Canada under agreement with CANADIAN VICKERS LTD., Montreal, P. Q.

(Continued from page 126)

than two hundred patents on controls and has been a pioneer in development of thermoelectric devices. Over twenty years ago the principle of generating electricity with a small pilot flame for remote operation of an automatic valve was put on the market by General Controls and is still being sold to provide a safety shut-off for gas-fired systems.

The company has grown under the stimulus of planned expansion based on what Mr. Ray calls the three-legged stool of engineering, production, and sales. In 1943, General Controls was awarded the Army-Navy "E" and two years later was producing at the rate of $5.9 million a year. The growth ratio continued after World War II as sales more than doubled between 1950 and 1955.

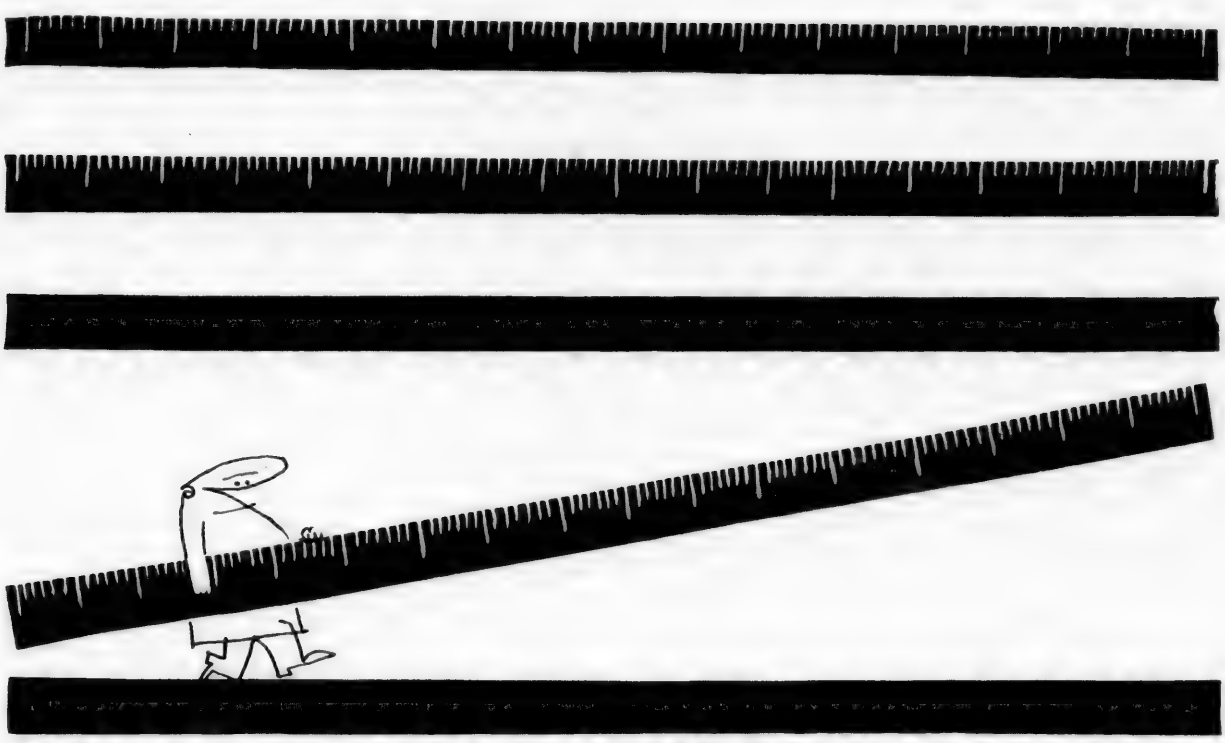
General Controls has been a major supplier of controls for air conditioning and refrigeration, of control valves for the airframe manufacturers, and has made impressive progress recently in the missiles and electronics fields.

General controls now has six producing factories in the United States and one each in Canada, West Germany, and England. It maintains 44 factory-owned branch offices in major cities throughout North America.

PUMP THEORY AND DESIGN IS SEMINAR PROGRAM SUBJECT

On February 8 and 9, the Standard Pump Division of Worthington Corporation began its 1960 seminar program by holding the first two sessions in New York City. Entitled "Rotary and Centrifugal Pump Theory and Design Seminars," the educational, non-commercial program attracted over 250 persons each day. It ran from 9 a.m. to 5 p.m., and included a 45-min question and answer period.

Later, a group of key executives will travel to El Paso (February 29), Salt Lake City (March 7), San Francisco (March 14), Portland (March 21), and Seattle (March 24) to present the program to consulting engineers, design engineers, distributors, OEM personnel, and plant engineers.



Estimate with confidence

The ARI Seal of Certification identifies unitary* air-conditioning equipment you can count on. You can specify this equipment with confidence, knowing it is built and backed by one of 46 manufacturers producing more than 90% of the unitary equipment sold today.

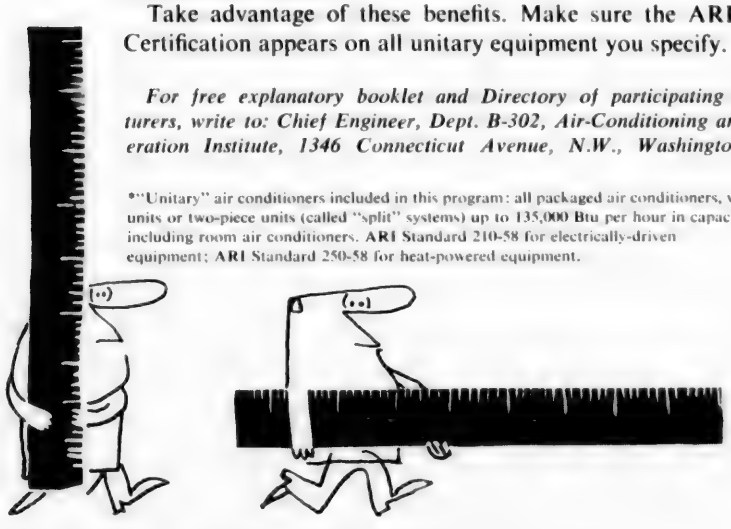
The Seal appears only on equipment meeting industry-approved performance standards; equipment subject to testing under adverse conditions —with emphasis on wilting heat and high humidity. It establishes a standard of comparison of ratings between brands.

That's why ARI-certified equipment makes it easier for you on any job. When you specify units bearing the ARI Seal, you are assured that they will provide the cooling power claimed. The result: quicker sales with less trouble for you—fewer complaints, fewer service calls, less repair and replacement expense.

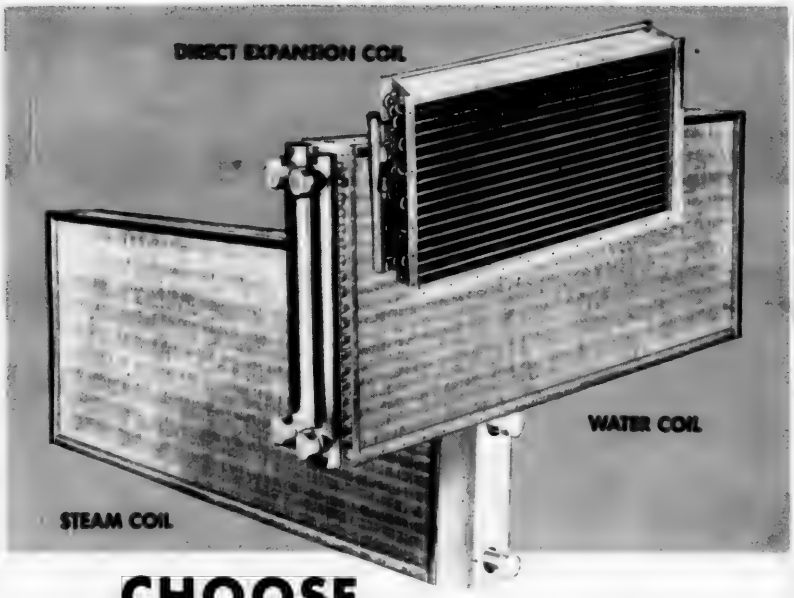
Take advantage of these benefits. Make sure the ARI Seal of Certification appears on all unitary equipment you specify.

For free explanatory booklet and Directory of participating manufacturers, write to: Chief Engineer, Dept. B-302, Air-Conditioning and Refrigeration Institute, 1346 Connecticut Avenue, N.W., Washington, D. C.

*"Unitary" air conditioners included in this program: all packaged air conditioners, whether single units or two-piece units (called "split" systems) up to 135,000 Btu per hour in capacity, but not including room air conditioners. ARI Standard 210-58 for electrically-driven equipment; ARI Standard 250-58 for heat-powered equipment.



this seal helps you sell



CHOOSE BOHN KNOWN-CAPACITY COILS

ALL BOHN COILS are ruggedly built...

Die-formed plate-type aluminum fins... from 4 to 14 per inch...with self-spacing collars completely covering the tubes. Permanent, tight, metal-to-metal fin-tube bond.

Heavy-gauge casings die-formed from galvanized steel.

Headers of heavy-wall seamless copper tube with heavy die-formed end caps. High pressure tested at 320 psig. minimum air pressure under warm water.

Tested and rated according to ASRE-ASHAE standard 33-58.

IN ADDITION...

DIRECT EXPANSION COIL — Type DE, insures equal distribution of refrigerant with brass pressure-type distributors;

WATER COIL — in Types WH, WF, and WD, is drainable in every type;

STEAM COIL — in Types S, NFS, and NFO, has condensing tubes pitched in casing a minimum of ⅛" per foot of tube length, as well as orificed steam supply tubes, and coil tubes floating free within coil casing to prevent stress and strain on tubes and joints... maximum operating pressure 200 psig. at 400° F.

A Memo from BOHN:

We are one of the largest manufacturers of specially designed evaporators and condensers for Original Equipment Manufacturers of refrigeration and air conditioning units and systems.

For full information, call or write...

BOHN *Buy the known line... the BOHN line*

Aluminum & Brass Corporation

Danville Division • Danville, Illinois

BRIEFLY STATED NEWS ITEMS

Representatives of seventeen national trade associations and technical societies, at a General Conference in New York called by the American Standards Association, voted to recommend the estabishment of an American Standards project on installation and utilization of industrial gas equipment.

The conference recommended that the project be sponsored by the American Gas Association and be titled "Industrial Gas Equipment Installation and Utilization."

Suggested scope of the project is establishment of basic standards for installation, safe operation, testing, maintenance, and nomenclature of industrial gas utilization equipment and such remote in-plant gas-air proportioning and mixing equipment which may be employed with that equipment.

Standards are also to include in-plant gas piping supply systems.

Emphasizing their interest in encouraging young men to follow careers in the fields of temperature conditioning, Western Air Conditioning Industries Association, for the second time, presented a check to California State Polytechnic College Air Conditioning Department, for use in developing relations between that school and high schools and colleges of California.

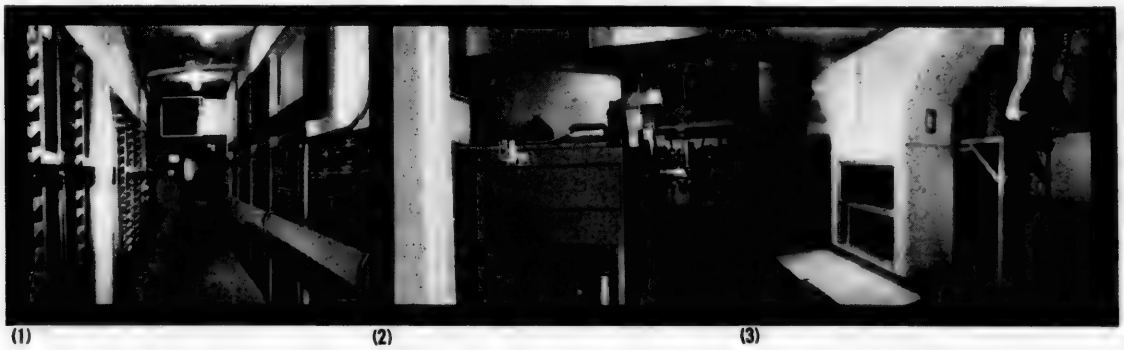
The program is intended to acquaint high school and junior college students with the broad opportunities available in the air conditioning industry.

The San Luis Obispo college offers a varied educational program designed to prepare students for positions in air conditioning.

C. L. Ringquist, manager of the application engineering department of The Trane Company, La Crosse, Wis., is a contributor to the current edition of *The World Book Encyclopedia*. Mr. Ringquist revised and rewrote the encyclopedia's article on air conditioning. *The World Book* is a 20-volume set, said to be

(Continued on page 132)

Construction Costs Cut $3,000 with TYPHOON Air Conditioning!



(1) (2) (3)

FLEXIBLE UNITS ALLOW ENGINEERS TO DESIGN SPACE-SAVING INSTALLATIONS IN NEW JEWEL FOOD SUPERMARKETS. Beyond their superior components and parts, Typhoon units deliver a big plus—flexibility to fit every need at a price that means savings to your clients. ¶ For example, by means of a unique Typhoon indoor installation that expands to meet future needs, Jewel Food Stores averaged $3,000 in construction savings per new supermarket. ¶ Several smaller units with one large evaporator were decided on for each store, rather than a single air conditioner. A separate room served as the condenser air intake plenum (picture no. 1). Oversize condensers were installed to permit re-use of air that had been previously used through the condensers of store refrigeration fixtures (picture no. 2). Two half-million B.t.u. oil-fired furnaces were mounted side by side above Typhoon evaporator blower (picture no. 3). A carefully engineered control system was created. Results: lower construction costs, lower operating and maintenance costs, less floor space used, and complete compatability with store decor achieved! ¶ No matter how unusual or difficult your requirements may be, you can rely on Typhoon to fill the bill best at the lowest possible price. For more information on the industry's most complete line of air conditioners, write Typhoon today. Get your free copy of the 20"x28" Reference Chart on the broad Typhoon line.

TYPHOON
DIVISION OF HUPP CORPORATION

TYPHOON AIR CONDITIONING DIVISION 2-C
Hupp Corporation
505 Carroll Street
Brooklyn 15, New York

☐ Please send me Reference Chart and full product literature on the Typhoon line.
☐ Please have a representative call for an appointment.

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FIRM_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____

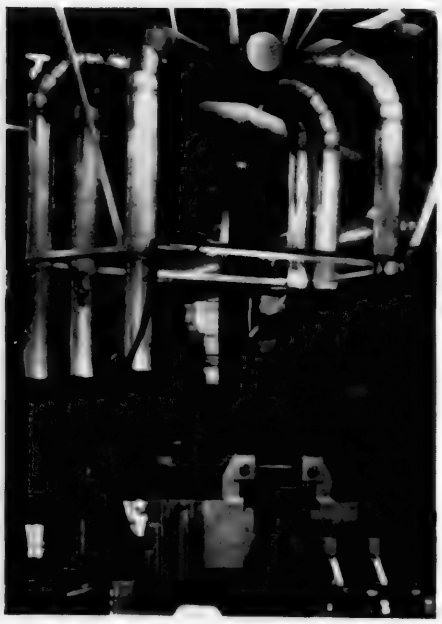
(Continued from page 130)
the largest selling encyclopedia in the English-speaking world.

The Office of Civil and Defense Mobilization, Washington, D.C., advises industry to prepare against possible thermonuclear attack, like government, by setting up automatic lines of succession for all key officials, providing for safe storage of essential records, selecting alternate sites from which industry can be conducted, and providing for emergency use of all personnel, resources, and equipment.

Air conditioning in the fifty new cars of the Hudson & Manhattan Railway, popularly known as the Hudson Tubes, resulted in a noticeable increase in traffic, running on some days as high as 15% above corresponding days of the previous summer. This is attributed to the riding public's reaction to the air conditioning and smooth riding of the new cars. These are the first 'production-run' cars for rapid transit service to be fully air-conditioned and the results obtained in service have been very satisfactory, the Winter General Meeting of the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS was told . . .

The Mechanical Engineering Department at the UNIVERSITY OF FLORIDA and the Solar Energy Applications Committee of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS will hold a Solar Energy Symposium on April 4 and 5, 1960, in Room 512, Engineering and Industries Building, Gainesville. Seven or eight sessions are planned to include present importance of solar energy, basic considerations, solar collectors, water heating, furnaces, refrigeration, distillation, and others. Readers of ACHV are cordially invited to attend this symposium. Additional information may be obtained by writing Professor John C. Reed, Head, Mechanical Engineering Department, or Professor E. A. Farber, departmental program director.

YOU SAVE MORE WITH FLEXAUST® HOSE



Thousands of successful installations prove that use of Flexaust hose and Portovent retractable duct with metal duct systems lower installation costs – but there are other important advantages

Exceptional abrasion resistance
Corrosion resistance
Noise absorption
Durability under heavy flexing
Provision for expansion and contraction
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Made of high quality neoprene coated fabrics 1¼ to 36" i.d.

Write today for full details
Distributors in all principal cities

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NEW YORK 17, N. Y.

WITH THE ENGINEERS

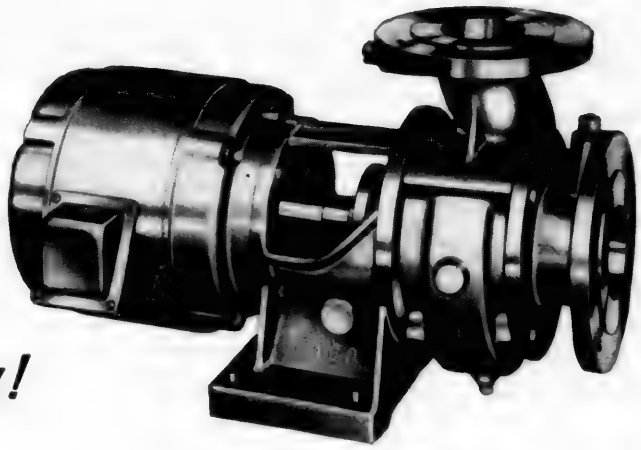
THE R. T. PATTERSON COMPANY, INC. has recently opened offices at 350 Grant Building, Pittsburgh, Pa., and announces a greatly expanded operation in the field of consultation, engineering, management, and construction of industrial utility, and steel enterprises. They have a greatly augmented staff of engineers, and constructors. Principal of the firm, R. T. Patterson, formerly was president of Patterson-Emerson-Comstock, Inc. . . .

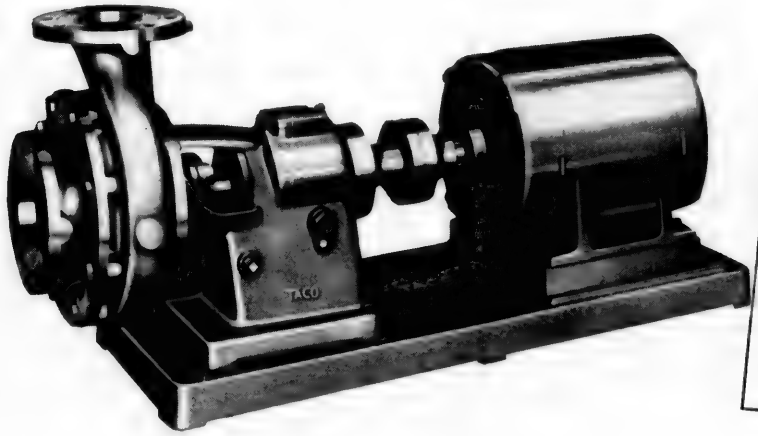
FRED S. DUBIN ASSOCIATES, Consulting Engineers, have moved to enlarged quarters at 635 Farmington Ave., Hartford, Conn. This office is the center of the firm's wide enterprises. Other offices are maintained in Boston, New York, St. Louis, and San Juan, P. R. James H. Quinlan was promoted to an Associate in the firm. He was project engineer in charge of the facilities for the new $12,500,000 Connecticut State Prison and the Northwest Catholic High School. The firm is playing a prominent role in Puerto Rico's "Operation Boot Strap," presently designing four hotels, hospitals, a bio-medical laboratory, office buildings, educational facilities at the University of Puerto Rico, and housing projects. The Puerto Rican office is under the direction of Victor Garcia in Santurce, who is a partner with Fred S. Dubin and Harold L. Mindell . . .

Bohdan G. Passty has assumed the post of development engineer in charge of the Humphrey heating division of ARKLA AIR CONDITIONING CORP., Evansville, Ind., according to W. R. Stephens of Little Rock, Ark., president of the corporation. Mr. Passty, a veteran in the heating and refrigeration field, was born in the Russian Ukraine, obtained a bachelor of economics degree from the Academy of Economics in the Ukrainian city of Lvov, obtained a bachelor of science degree from the University of Berlin, and then moved to Austria to do postgraduate work at the University of Innsbruck. In 1948, he and his

(Continued on page 134)

Now...
the pump line
with total
range efficiency!





Standardized Line...
Special Capabilities

- Highly Standardized Component Parts
- Self-Venting Centerline Discharge
- Mechanical Seals or Stuffing Boxes
- Ball or Sleeve Bearing Frame
- Stainless Steel Shaft Sleeves
- Casings Adaptable to Horizontal Discharge
- Available with EXTRA Quiet Motors

TACO "LP" *Single Stage Centrifugal Pumps*

High overall efficiency throughout its entire usable range is a basic characteristic of every TACO "LP" Series Pump. And the *complete selection* of sizes available gives *complete* coverage . . . permits each pump to be precisely tailored to the installation. As a result, you're *certain* of better performance when you specify an "LP" . . . and can often save on motor cost and power consumption.

Many of the outstanding advantages of the "LP" line are the result of their "preferred number" design (ASA Standard No. Z 17.1). Using it, TACO was the first manufacturer with a line of pumps uniformly designed and engineered to provide the broadest possible performance field with the minimum number of pumps. It gives consulting engineers and contractors pump versatility and quality that they can specify with confidence.

TACO also manufactures a complete line of smaller pumps and circulators for air conditioning and heating installations. Get complete specifications in time for your next installation.

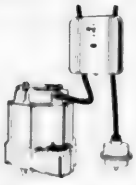
Write TACO HEATERS, INCORPORATED, 1160 Cranston Street, Cranston 9, Rhode Island.

Taco

SERVING THE HYDRONIC INDUSTRY SINCE 1920

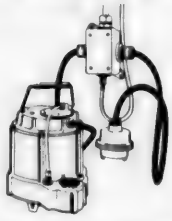
Here's the NEWEST in
KENCO
Submersible Pumps
The Original and best yet!
A-1246A

NEW 3-phase 230-volt Industrial Pump



Rugged cast-bronze construction with 5000 GPH at 10' head pumping power, this new Kenco Model 330 is fully automatic, complete with external liquid level control and motor starter. Non-automatic model furnished as pump only.

NEW Variable Hi-Turn-On Heavy-Duty Pump



To remove measured amounts of fluid automatically determined by the height at which the hi-turn-on control is set, Kenco's complete pump package also eliminates frequent cycling. This water-tight unit is designed for operation in humid atmospheres or where flooding of power source may occur.

Approved Multi-Purpose Model 109 Pump

Moves fluids fast—3300 GPH at 10' head—bronze or cast iron—easy to install, no floats to adjust, no wires to foul up.

See Your Wholesaler!

KENCO PUMP
Division of The American Crucible Products Co.
[illegible] Avenue • [illegible]

Briefly Stated

(Continued from page 132)

wife came to Canada and settled in London, Ontario, where he was employed by General Steel Wares as a development engineer in the production of central heating, refrigerators and cooking appliances. He moved to the United States in 1957 and settled in Chattanooga, Tenn., where he continued his work as a development engineer in the heating and air conditioning industry . . .

Ernest Kroder has been appointed chief engineer of the standard products line by COPELAND REFRIGERATION CORP., Sidney, Ohio. He was formerly associated with the Lehigh Manufacturing Company as general manager, Special Products, the Keeny Manufacturing Company, and the Bridgeport Brass Company.

SOCIETY NOTES

At a recent meeting of the California chapter of the AMERICAN SOCIETY OF SANITARY ENGINEERING, plans for the next Annual Meeting of ASSE, to be held in San Diego, were revealed. Headquarters will be the U. S. Grant Hotel, from October 9th to 14th, 1960. Chairman will be Ed Beale and publicity chairman, Jim Christie. The dates were selected to help those who might also want to attend the convention of the Western Plumbing Officials Association in Reno, Nev., October 3rd to 7th . . .

Appointment of three division heads of the new Marketing Department of the National Coal Association was announced. Carroll F. Hardy was named director of the BITUMINOUS COAL INSTITUTE DIVISION. Mr. Hardy was managing director of BCI before it merged with NCA. Harry C. Ballman was made director of the Air Pollution Control Division, working with government agencies, civic organizations and coal industry groups, to obtain cleaner air from processes utilizing coal. Mr. Ballman was formerly manager of field engineering services of BCI. Paul L. Brown became director of the Manpower Development Division. He will initiate, administer, and participate in all industry-wide programs previously carried on by the American Coal Sales Association, where he was director of training and education. The American Coal Sales Association merged with NCA recently . . .

The American Boiler Manufacturers Association & Affiliated Industries, Cleveland, Ohio, and the American Boiler and Affiliated Industries Standards Committee, New York City, are merging operations under the name of the Association as it was established in 1888. On March 1, the name and address will be AMERICAN BOILER MANUFACTURERS ASSOCIATION, Raymond Commerce Bldg., 1180 Raymond Blvd., Newark 2, N. J. Henry E Aldrich is manager . . .

ASSOCIATED LABORATORIES, INC., with headquarters at 26845 Southfield, Lathrup Village, Mich., has been formed for the purpose of promoting higher water treatment standards, offering service to water conditioning problems in all areas, to provide member firms with a channel for interchange of knowledge and research facilities, and to facilitate national advertising. Through this Association, it is said, it will be possible to obtain water conditioning information about the whole country from one source. The Association will welcome any inquiry with regard to water treatment for cooling towers, power plants, threshold and process water application, and will, in turn, recommend a local representative to service or consult if so desired. Originator of the idea of the Association, Don R. Borgeson, president of Vulcan Laboratories, Pontiac, Mich., was elected first president at the Association's first meeting in Atlanta, Ga. . . .

Hugh T. Williams, manager of engineering and industrial sales, Owens-Corning Fiberglas Corporation, has been elected vice-president of NATIONAL INSULATION MANUFACTURERS ASSOCIATION, New York, N. Y. He succeeds Robert A. McLaughlin, vice-president, Pittsburgh Plate Glass Company. NIMA

(Continued on page 136)

ENGINEERS

A dynamic, rapidly expanding manufacturer in the field of xerography (physical photography based on solid-state and electrostatic phenomena) has outstanding growth opportunities for:

Air Conditioning Engineer

B.S.M.E., with at least 6 years' experience in heating, ventilation, and air conditioning, preferably in industrial process work.

Project Engineer—Plant Engineering

B.S.M.E., with 5 to 10 years' experience in design, selection, installation, and servicing of industrial processes in mechanical equipment. Must be capable of supervising complete projects.

Kindly send resume and salary requirements to:

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Industrial Relations Division
HALOID XEROX INC.
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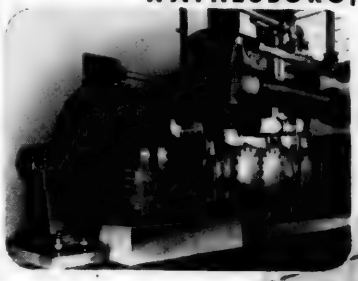
HALOID XEROX®

No name among American makers of cooling equipment stands higher or has endured longer than that of Frick.

Back of the Frick trademark are 107 years of experience in engineering, 78 in refrigeration and ice making, and 55 in air conditioning. You get the value of this priceless experience when you invest in dependable Frick equipment.

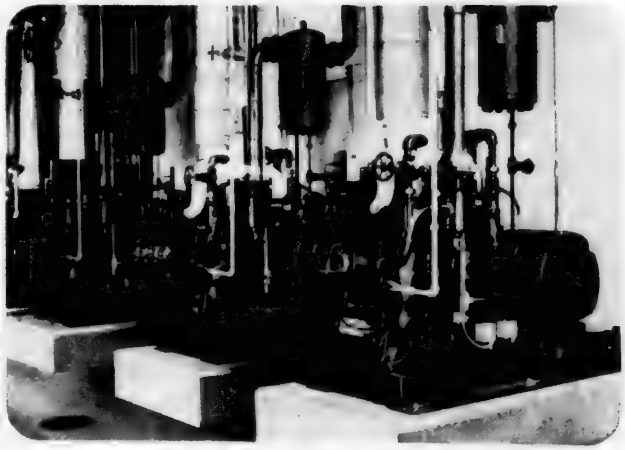
Write, wire or phone now for catalogs and estimates.

FRICK COMPANY
WAYNESBORO, PENNA.



Left — Frick heavy-duty compressors are the standard of the world for industrial work. Ask for Bulletin 112.

Right—These Frick evaporative condensers are saving $1,000 per month. See Bulletin 235.



Frick "Eclipse" compressors have 2, 3, 4, 6 or 9 cylinders, offer speeds up to 1200 r.p.m. See Bulletin 100.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA., U. S. A.

Fastest—Easiest Way to Seal Ducts and Apply Insulation

Arno®

DUCTAPE

√ Self-adhesive . . . sticks to any duct material or insulation.
√ Nothing to mix . . . saves labor.
√ Vaporproof . . . waterproof.
√ Stops air leaks at all joints.
√ Makes insulation jobs easier.
√ Ideal for slab ducts, too.
√ Flame-resistant type available.

Ask your jobber for DUCTAPE.

Manufacturers Agents Wanted for Some Selected Areas

Write for FREE Test Sample

ARNO ADHESIVE TAPES, INC.
Dr. Scholl's Adhesive Tape Division
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Send Today for this New 60-page Catalog

Simplifies selection . . . speeds specifying!

Complete "buyer's guide" to Peerless Electric "Power Fixed" Blowers, covering sizes from 12¼" to 89" wheel diameters. Contains full performance tables, specifications, dimensions, selection and application data, and accessory information. All Peerless Electric Blower Assemblies carry the AMCA certified rating seal and are unconditionally guaranteed. Each complete unit is designed to exceed industry standards and is thoroughly tested before delivery. Fill in coupon for your copy of this helpful guide.

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PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

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Gentlemen: Please send me your new catalog 260 on "Power Fixed" Blowers.

NAME _____

COMPANY _____

ADDRESS _____

Briefly Stated

(Continued from page 134)

members are manufacturers of inorganic thermal insulations covering the full temperature range. The association was formed in January, 1959, as the successor to two previous associations: Industrial Mineral Insulation Manufacturers Institute and the Magnesia-Silica Insulation Manufacturers Association.

BURGEONING BUSINESS

AIRTEMP DIV., CHRYSLER CORP., inaugurated its first West Coast branch office and warehouse at 6001 E. Randolph St., Los Angeles 22, Calif. Rapid population growth in Southern California and the entire West Coast, the flourishing economic predictions for the next decade, and the area's climate and ascending acceptance and demand for air conditioning were cited as reasons for the move. The company stresses that opening of the branch does not effect the Division's general policy of distribution through independently owned and operated wholesale distributors. They were unable to find a qualified distributor in this case, it said. The company has recently closed branch offices in Detroit and Kansas City . . .

As a result of its success of its Eastern warehousing activities, RECOLD CORPORATION, Los Angeles, Calif., has begun manufacturing operations at new facilities in Columbus, Ohio. The products fabricated by this new plant, which was opened on January 15th, will be supplied to the entire Eastern Seaboard, as well as some midwestern states. The plant will fabricate much of the company's line of air conditioning and refrigeration products. The Eastern warehousing facilities, opened two years ago, have also been moved to this new location. Distributors will now be able to offer one-day service to a large part of the East Coast. With the opening of the new Eastern plant, Recold is now engaged in manufacturing operations at Los Angeles, Calif.; Durango, Mexico; and Columbus, Ohio. Construction

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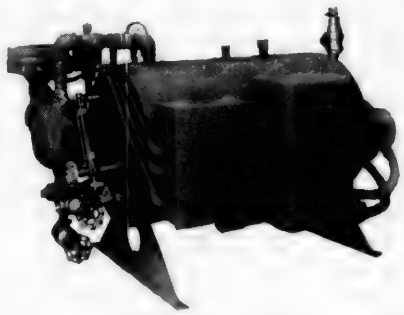


NEW—ELECTRIC STEAM BOILERS

10 sizes — .6 H.P. to 6 H.P.
6 KW to 60 KW.
240 or 480 volts normal
208 " available
Highly sensitive adjusting controls.

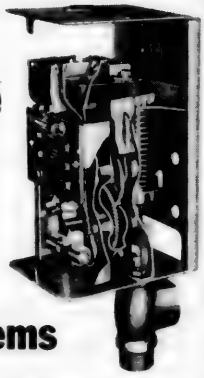
ALL SIZES ASME construction,
National Board inspected,
Underwriters listed.
100 lbs. max. operating pressure.

Perfect for department store alteration rooms, plastic laboratories, hospitals, etc. Also full line of small gas fired and oil fired boilers, 100 to 125 lbs.

P. M. LATTNER MFG. COMPANY
Cedar Rapids, Iowa

ENGINEERED BY EDWARDS

Low Cost, Motorized Zone Control Valve Perfect For Hot Water Or Steam Systems



- Completely enclosed, hermetically sealed silent mercury switches
- Completely silent, long life, rugged • No thermal leakage, trouble-free, guaranteed, ¾" to 3" sizes • Powerful electric motor — 24 or 115 volts • Positive shut-off

FREE....70 page design handbook on single and multi-zone hot water baseboard heating systems.

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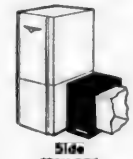
"One of the nation's largest manufacturers of [illegible] and commercial [illegible] Lighting and Service Equipment. Motorized Valves for Steam and Water Control [illegible]

Every Home is a prospect for a low-cost

Health-Air®

Here's Your Chance to Get Into a Huge Rich Market Ahead of Competition!



Side Mounted Base Flow

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Now, for the first time, you can sell and install a really practical electronic air cleaner at a high volume price. Health-Air has no peer in the field today. A 3-stage unit (mechanical filter for large particles, electrostatic filter for fine particles and charcoal filter for smells, gases, smoke, etc.) which can be installed in the return side of a furnace or air conditioner for heating or cooling before recirculation. Every household is a prospect. Saves on heating bills, keeps air in homes clean and pure. Wonderful relief for hay-fever or allergy sufferers.

Write today for all the facts.

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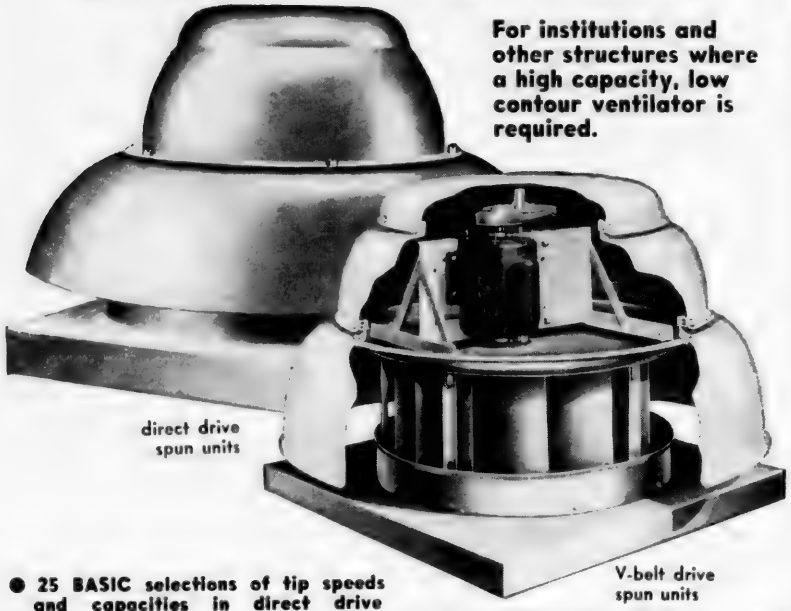
NEW Burt Spun Aluminum Direct and V-Belt Drive Centriflow Fan Ventilators



For institutions and other structures where a high capacity, low contour ventilator is required.

direct drive spun units

V-belt drive spun units

- **25 BASIC selections of tip speeds and capacities in direct drive models.**
- **64 BASIC selections of tip speeds and capacities in V-belt drive models.**
- **CAPACITIES from 65 to 27,648 CFM.**
- **HORSEPOWER ratings from 1/60 to 7½.**
- **SIZES from 6" through 48" wheel diameters.**
- **STATIC PRESSURE range from 0" through 1" W.G. (higher static pressures on application).**
- **LOW PROFILE heavy gauge spun aluminum housings.**
- **NON-OVERLOADING backward curved, non-sparking aluminum fan wheels.**
- **ADJUSTABLE SHEAVES on V-belt units to change capacities at anytime.**
- **DAMPERS available in drop-in sleeve type, automatic back-draft or motor operated.**
- **BURT DESIGNED for minimum noise levels.**
- **AMCA CERTIFIED capacity ratings for units of 16" wheel diameter and larger.**

Send for **FREE** *Data Book!*

Write for Burt Data Book SPV-101-H.
It supplies quick data on Burt's complete line of modern Roof Ventilators.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South St. Akron 11, Ohio

MEMBER AIR MOVING & CONDITIONING ASSOCIATION, INC.

Briefly Stated

(Continued from page 136)

will soon begin on a 50,000 sq ft addition to the Los Angeles plant. This overall expansion program will mean that production capacity will be more than doubled during 1960 . . .

MARSH INSTRUMENT COMPANY, DIVISION OF COLORADO OIL AND GAS CORP., of Skokie, Ill., recently announced plans for a large expansion program. Contracts for factory enlargement have been awarded and orders for additional machinery and equipment have been issued or will be in the near future. Upon completion of the program, an increase of 40% of production capacity will have been added to the existing facilities . . .

JOHN WOOD COMPANY, New York, N. Y., has organized an air pollution control division. The company, which manufactures petroleum marketing equipment, domestic and industrial products, has located its new division at Bernardsville, N. J. The division has been staffed with a team of engineers and scientists that will provide a complete engineering service for the correction of air pollution problems. The company will also have a line of air pollution control products soon to go into production . . .

HOWELL ELECTRIC MOTORS COMPANY, Howell, Mich., has acquired the flat-type motor line of Diehl Manufacturing Company, electrical division of Singer Manufacturing Company. These motors are widely employed in the machine tool industry and in the operation of turret lathes, punch presses, milling machines, pumps, oil burners and exhaust systems. The newly-acquired Diehl line will augment the line of fractional and integral horsepower motors manufactured by Howell . . .

TYPHOON AIR CONDITIONING DIV., HUPP CORPORATION, will open a Los Angeles factory branch at 2206 Hill Street in downtown Los Angeles. Los Angeles is the fastest growing major market for packaged air conditioning and heat pumps, the com-

pany said. The branch will serve thirteen counties from Bakersfield to the Mexican border and eastward to Arizona. Dick Southworth has been named manager of the branch. He was formerly manager of air conditioning sales for Sues, Young & Brown, Los Angeles . . .

CRANE COMPANY announced a major decentralization of its rapidly growing manufacturing facilities and marketing organization. Wesley A. Songer, president, said the company has been formed into five groups, each with its own manufacturing, engineering, sales and control divisions. They are: Industrial Products Group, Chicago; Plumbing-Heating-Air Conditioning Group, Johnstown, Pa.; Crane Supply Company, Chicago; Systems and Controls Group, headquarters yet to be named; International Group, New York City, an entirely new function. The new arrangements unite Crane Co. with the five firms purchased since last September: The Chapman Valve Mfg. Co., Springfield, Mass.; Pipe Fabricators, Inc., East Chicago, Ind.; The Swartwout Co., Cleveland, and National-U. S. Radiator Corp., Johnstown, Pa. A fifth acquisition, Canadian-Pittsburgh Piping, Ltd., has become part of Crane, Ltd., Canada, a wholly-owned subsidiary of Crane Co.

NEW REPRESENTATIVES

JAY R. SMITH MFG. COMPANY, Union, N. J., announces appointment of Carl E. Knigge, C. E. Knigge Co., No. Little Rock, Ark.; and Robert Wilson, Florence, Ky., as sales representatives for the company's line of chair carriers, drains, and engineered plumbing products . . .

Bartholomaus Enterprises, Inc., New York, N. Y., have been appointed sales representative to sell heating and cooling coils in Metropolitan New York and the surrounding counties in New York and New Jersey by the Heating & Cooling Coil Department of the Danville (Illinois) Division of BOHN ALUMINUM & BRASS CORPORATION. Bartholomaus Enterprises, Inc. are

Anderson Quik-Flex Thermostatic Steam Trap— Guaranteed Freeze-proof for Two Years!

Guaranteed when properly installed and operated, this freeze-proof Anderson Quik-Flex Thermostatic Steam Trap is ideal for tracer lines, meter boxes, drips and other outdoor steam processing equipment used in chemical, refinery, solvent and other industrial plants.

Correct installation requires free condensate drainage on the discharge side. A cooling leg of at least three feet is a necessity to cool condensate, since thermostatic traps operate on temperature differential. The strainer should be installed in a down position to avoid freezes which could break the strainer body.

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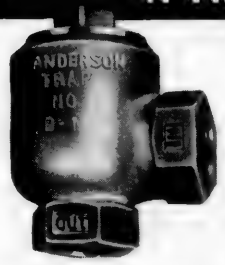

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a group of well qualified sales engineers who have established a fine reputation in selling and engineering in the heating, air conditioning, and ventilating fields . . .

WESTINGHOUSE ELECTRIC CORPORATION announces the appointment of the nine outlets of the Famous Furnace Company as distributors for its heating and air conditioning products in West Virginia, Ohio and Pennsylvania. These new distributors will handle the complete Westinghouse line of heating equipment; air-cooled and water-cooled residential air conditioners, self-contained units, and Precipitron electronic air cleaners.

UP ON TOP

Appointment of William A. Boone as executive vice-president and treasurer of BELL & GOSSETT COMPANY, Morton Grove, Ill., was announced. Formerly vice-president in charge of sales, he succeeds Clarence E. Pullum who passed away on January eighth. Mr. Boone joined B&G in 1940 as a sales engineer in the heat transfer department. He was promoted to assistant sales manager in 1947, sales manager in 1955, and vice-president in charge of sales in 1957 . . .

Robert A. Wasson was elected president and general manager of CLARAGE FAN COMPANY, Kalamazoo, Mich. A vice-president and general manager since 1945, he succeeds Harry R. Clarage, who died suddenly on December 26. Mr. Wasson is a 1922 graduate of Cornell University with a degree in mechanical engineering. After a sales engineering course at the Clarage home office, he served in the Chicago, Kalamazoo, and New York sales offices, returned to Kalamazoo in 1944 as assistant general manager, and was elected to the Clarage board of directors and was elevated to vice president and general manager, a position he has held since that time . . .

Election of Theodore M. Dillaway as vice president, and George P. Schivley as vice-president of manufacturing, of BUFFALO FORGE COMPANY, Buffalo, N. Y., was announced. Mr. Dillaway continues as director and secretary of the company and Mr. Schivley as a director of the company . . .

Election of Earl A. Erich as vice president of TUBE TURNS PLASTICS, INC., an affiliate of Chemetron Corporation, Louisville, Ky., has been announced. Mr. Erich is a graduate of Muhlenberg College with a B.S. degree in chemistry. He began his business career as a research chemist for Atlas Mineral Products Company and later organized that company's thermoplastics division. He joined Tube Turns Plastics' technical service staff in 1955 as a specialist in solving piping corrosion problems.

M. R. "Milt" Van Zanten is the new president of SWAN MFG. CO.,

(Continued on page 142)

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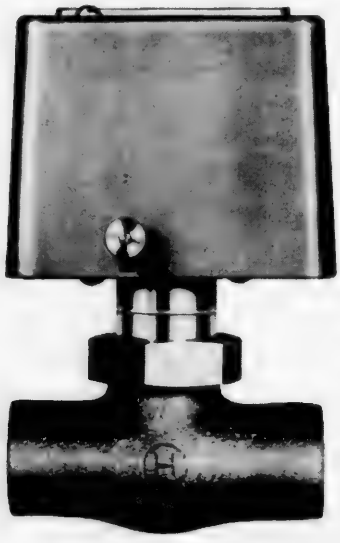
only Zonvalve® has all these important features:



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Raises and lowers valve stem with silent power.

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Teflon surface of valve stem provides a permanent, self-lubricating seal.

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Gradual opening and closing cycles prevent noise in line.

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Compact body makes installation easy, even in tight places.

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Manual Operator conveniently located on outside of cover, always accessible.

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Vortex Company
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Hyde Park, Boston 36, Massachusetts

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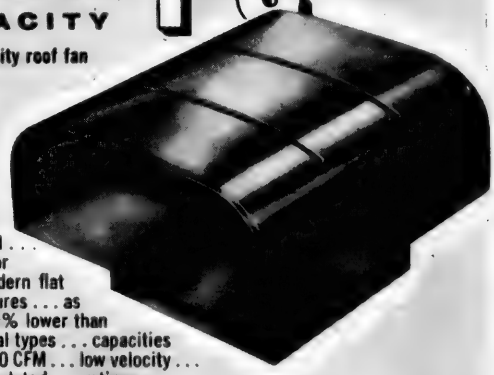

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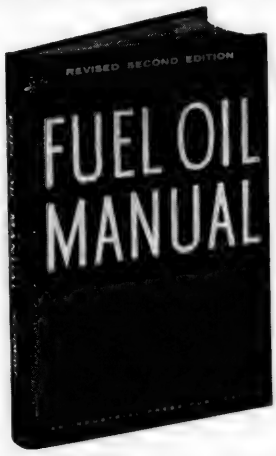

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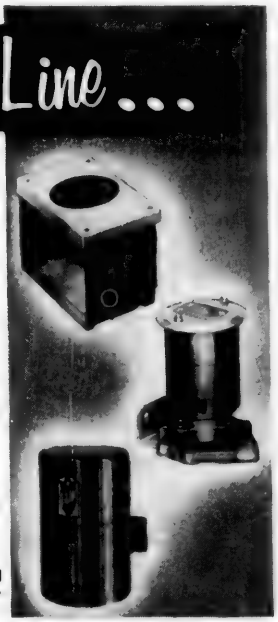

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"All-Plastic" low cost unit. 9 ft. V., lift. 300 ft. H. run. In-pan installation. Sump available when required.

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For CLOSE-TO-FLOOR, low inlet connection. 21 ft. V. lift. 300 ft. H., run. Packaged unit. Long life.

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CONDENSATE PUMPS FOR AIR CONDITIONING EQUIPMENT

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IT'S BETTER
IT SAVES MONEY

The all-new Triangle Valve by U. S. Valve & Engineering Co. is a combination of TWO precision-engineered butterfly valves in a flanged T. It gives perfect flow control in cooling water systems where two streams flow to or from a single pipe.

The U. S. Triangle makes obsolete — in initial cost, ease of installation, maintenance, and general operating efficiency — the conventional use of separate flanged T and butterfly valves. If you're using or considering use of a T and 2 butterfly valves, a U. S. Triangle will save you money and do the job better.

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Briefly Stated

(Continued from page 140)

Vancouver, Wis., manufacturers of Vecto-Ray baseboard heaters, wall heaters and thermostats. Also announced is the appointment of William Leiner as vice-president in charge of production and secretary treasurer. Mr. Van Zanten who joined the firm in 1956 as factory representative, was more recently its advertising and public relations director.

RECENT APPOINTMENTS

Andrew F. Ward, vice president of marketing, announced the appointment of Don F. Bennett to assistant vice president of marketing of WARREN WEBSTER & COMPANY, INC., Camden, N. J. The firm also announced that James J. Bubser has been appointed product sales manager for radiation and steam specialties, two of the firms nationally distributed product lines . . .

Appointment of J. William O'Brien as district sales manager for southwestern Pennsylvania and northern West Virginia has been announced by REZNOR MANUFACTURING COMPANY, Mercer, Pa. Mr. O'Brien will maintain headquarters at 132 East Jefferson Street, Butler, Pa. He succeeds his father, Joseph H. O'Brien, who has just retired. The elder Mr. O'Brien has been district sales manager for 23 years. He pioneered with the company the organization in his district of a selective distribution system, under which Reznor products are sold exclusively through wholesale distributors on the local level . . .

PENN VENTILATOR CO., INC., Philadelphia, Pa., announced the appointment of Leonard L. Hoffman as director of purchasing, responsible for purchasing for the East and West Coast plants . . .

J. L. Fitzgerald, formerly POWERS REGULATOR COMPANY'S San Francisco district manager, was promoted to the position of sales manager for non-installed products for the entire Western division, with offices in San Francisco. Don

important points about joints

- Yarway Gun-Pakt Joints are serviced *in the line under full steam pressure.*
- Costly shutdowns eliminated.
- Maintenance records show 1 manhour per year per joint.
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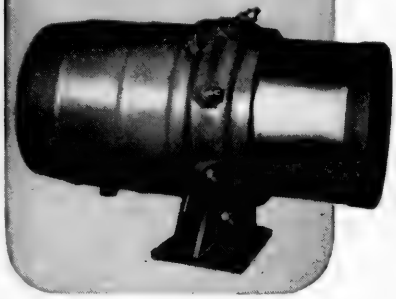

For new Yarway Expansion Joint Catalog EJ-1916 write YARNALL-WARING CO. 104 Mermaid Avenue, Phila. 18, Pa.

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Briefly Stated

R. Bachman was promoted to district manager of the San Francisco area . . .

Roswell Farnham, with BUFFALO FORGE CO., Buffalo, N. Y., for forty-six years, retired as Buffalo district sales manager. Glenn H. Johnson, Jr. succeeds him . . .

Appointment of William W. Cross as a sales engineer covering the Seattle, Wash., area was announced by DUNHAM - BUSH, INC., West Hartford, Conn. . . .

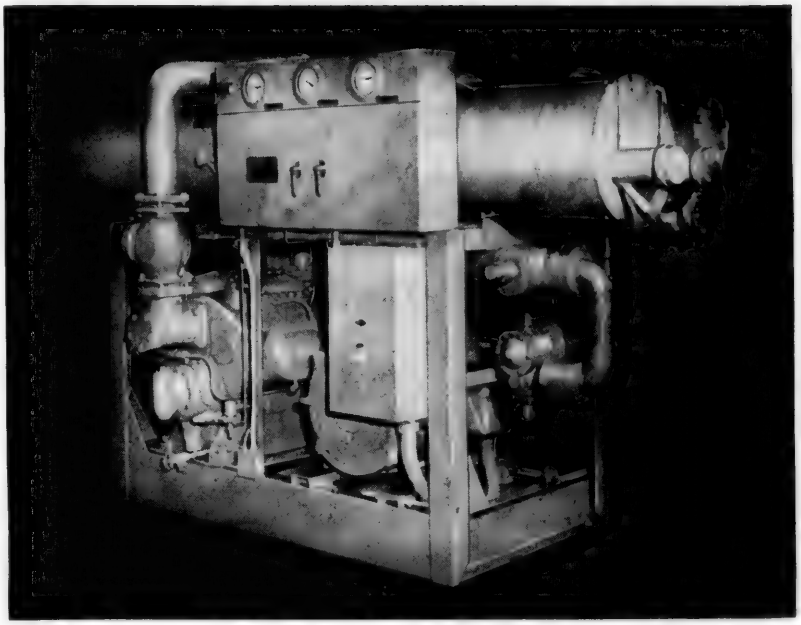
The following appointments were announced by THE TRANE COMPANY, La Crosse, Wis.: Milton L. Hoglund to manager of refrigeration applications engineering; Wesley W. Wright to succeed him as manager of centrifugal compressor sales; Thomas Shimanski to manager of the company's sales offices in Madison and La Crosse, Wis., replacing his father, V. E., who retired after 34 years with the company; William G. Barnard to manager of the Des Moines sales office, replacing Tracy Johnson, who has retired; and Robert A. McKee to manager of the new Albuquerque sales office . . .

Appointment of A. Paul Bencks as sales training manager has been announced by AMERICAN-STANDARD INDUSTRIAL DIVISION, Detroit, Mich. A graduate of Massachusetts Institute of Technology, Mr. Bencks joins the Division following eight years as sales director with H. E. Beyster & Associates, Detroit architects and engineers . . .

Appointment was announced of Lawrence H. Baker as manager of branch sales for CHRYSLER AIRTEMP DIVISION. He was an instructor at Rensselaer for two years and spent five years in engineering work before joining Chrysler Airtemp . . .

Marc McGuire, UTILITY FAN CORPORATION, a division of UTILITY APPLIANCE CORP., Los Angeles, Calif., has been promoted to the post of sales manager. A native Californian, prior to joining Utility Fan four years ago, he served with U. S. Electrical Motors.

Air conditioning made easy with new space-saving fully flooded Vilter Chiller



View of the new Vilter Flooded Uni-Chiller—100-ton nominal capacity.

Compact, space-saving design, low cost and a flooded water chiller are some of the important advantages of the new Vilter flooded type Uni-Chiller.

While especially suited for air conditioning applications, Uni-Chillers fit readily into almost any liquid chilling system.

Four standard sizes are offered—25, 50, 75 and 100-ton nominal capacities.

All components are sized to operate efficiently as a system. The flooded-type shell and tube cooler and the condenser are mounted above a rugged Vilter VMC compressor. Shipped assembled, the Uni-Chiller arrives with all interconnecting piping completed, controls factory wired, cooler and low-temperature piping insulated and a holding charge of refrigerant.

Motor and starter can also be supplied by Vilter and if desired, the compressor and motor can be run-in and all controls and gauges properly adjusted and set. By specifying a completely assembled unit, installation costs and start-up time are reduced . . . real savings to you.

Why not contact your nearest Vilter representative or write directly to Vilter for full details and application recommendations.

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ASHRAE Convention Papers

(Concluded from page 91)

Sound in Elbows with Turning Vanes

A paper on Attenuation and Generation of Sound in Elbows with Turning Vanes, was presented by W. K. Kerka, ASHRAE Research Laboratory. The objective of this study was to obtain information on elbows with vanes so that these data could be applied in predicting the acoustic performance of duct systems. Included in the paper were the results of a correlation of the sound attenuation and generation in elbows versus size, aspect ratio, and angle. Although the elbows and connecting duct were of standard Navy design, the information presented can be applied to commercial duct systems.

Air Conditioning Symposium

As part of an air conditioning symposium, Austin Rising, vice president and director of marketing, York Division of Borg-Warner Corp., said that engineering and marketing must become even closer bedfellows if manufacturers of air conditioners are to reach the sales heights predicted for 1960. To be successful, a design engineer must design a product which customers will buy at a profit to his company.

He used slides to show that leading products and styles of 20, 30 and 40 years ago are off the market and are almost forgotten today. Ten years from now, according to Mr. Rising, the products being designed, manufactured and sold in today's factories will be like yesterday's newspaper—out-of-date and unacceptable.

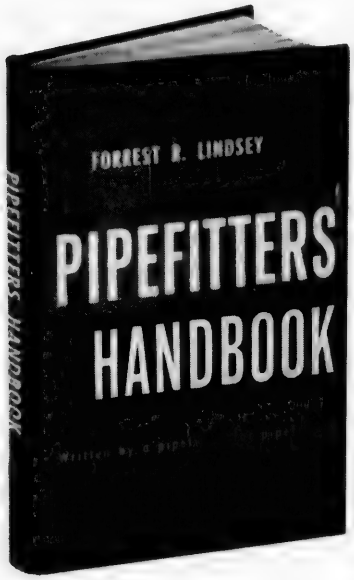
In his talk on Engineering for Engineering's Sake? by P. M. Augenstein, president, Airtemp Division, Chrysler Corp., attention was called to the fact that engineering should not be regarded as an end in itself but that it should be considered as part of an integrated cooperative whole.

In the final analysis, the engineer must so design his item that the final product, with its good points and its limitations, is designed to suit the customer. Too often the engineer sees engineering for engineering's sake alone.

W. G. Spiegelhalter, manager, Window Line Design, Air Conditioning Department, General Electric Co., said, "The engineer should be quality conscious, during the initial design of the room air conditioner, and he should have an awareness of the 'effect of quality' on the acceptance of the product.

"I believe that the engineer has an obligation to make his product function and perform in the manner specified; he has a responsibility to work with the industrial designer and to cooperate so that the room air conditioner is pleasing to the public. He must have an appreciation of how the room air conditioner fits into the decor of homes and office buildings. He should cooperate in the placement of controls and in providing instructions so that the customer can readily understand and operate the room air conditioner."

He also said that the engineer must keep up with the latest advances in engineering and abreast of the latest developments in his own specific area such as new processes and materials that hold promise for bettering the air conditioning industry.



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The second edition provides 126 more pages of useful information on many more subjects than the first. It extends the range of time-saving tables for bending and offsetting pipe and covers additional kinds of pipe and fittings. A complete, new treatment of plastic pipe, and a comprehensive subject index are included.

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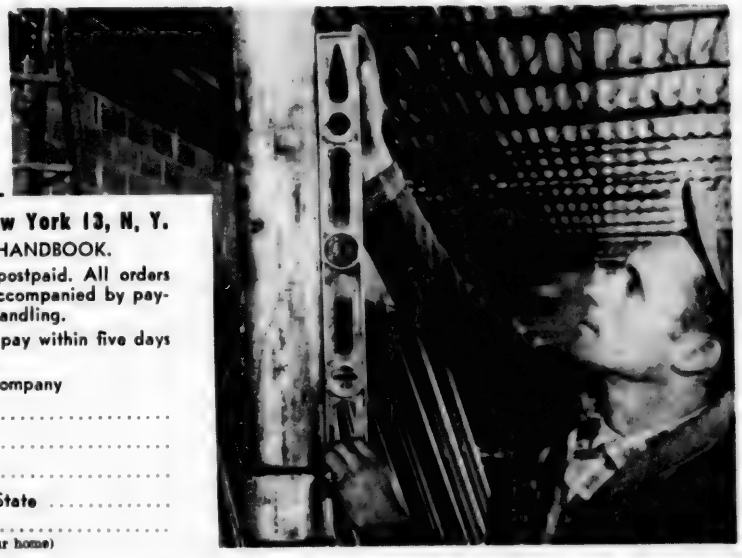

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BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

NUCLEAR RADIATION ENGINEERING

Intended for persons whose work is at the rim of the atomic circle, rather than for those who are engaged in detail work within that circle, the introduction to Nuclear Radiation Engineering by F. W. Hutchinson, professor of mechanical engineering, University of California, should prove of great value.

At present there is an industrial language barrier which causes concern on the part of the executive when he is required to make a decision based on advice or evidence which he does not fully understand. Therefore, one of the functions of this book is to provide the equivalent of a language primer for this field. Use of this book should help one to communicate more freely and also confidently with specialists who are engaged in some phase of atomic physics and nuclear engineering.

The book is divided into four parts: Part 1, a review of the methods used in establishing the structure of the atom; Part 2 investigates radiation phenomena in terms of atomic and nuclear structure; Part 3 deals with applications of radioactivity in terms of instruments, people and things and is based on Parts 1 and 2; Part 4 is a dictionary of atomic and nuclear terms and phrases.

This book is based on a series of lectures presented by Prof. Hutchinson for executives, supervisors and engineers at the Boeing Airplane Company in Seattle.

Nuclear Radiation Engineering, by F. W. Hutchinson. Cloth bound, 6 x 9 inches, 155 pages. Published by The Ronald Press Company, 15 E. 26th St., New York 10, N. Y. Price, $6.

PIPING AND PICK-UP FACTORS FOR ONE-PIPE WATER AND STEAM

Piping and Pick-up Factors for Automatically Fired One-Pipe Hot-Water and Steam Systems, by Warren S. Harris, professor of mechanical engineering and Chien Fan, research assistant in mechanical engineering, is a report of an investigation conducted by The Engineering Experiment Station of the University of Illinois in cooperation with the Institute of Boiler and Radiator Manufacturers.

The investigation was undertaken to supply data on the effect of the size of piping and pick-up factor on the performance of hydronic systems and to provide a logical basis for determining the minimum usable piping and pick-up factor.

Data are presented to support the authors' conclusions that (1) the same factor may be used for both steam and hot-water heating systems which are automatically fired; (2) A factor as low as 1.1 may be used for selecting the boiler for a system designed to maintain room air temperature at a constant value at all times, but that this low factor will not provide sufficient reserve for operation

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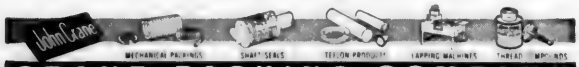

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with reduced room air temperature at night; and (3) A piping and pick-up factor of 1.3 is adequate for the successful operation of automatically fired steam or hot-water heating systems.

University of Illinois Engineering Experiment Station Bulletin No. 455, in soft cardboard cover, 8½ x 11 inches, 27 pages. Published by Engineering Publications Office, 114 Civil Engineering Hall, University of Illinois, Urbana, Ill. Price is fifty cents.

TEXT ON PLUMBING

The third edition of a standard text on plumbing practice has just been published by McGraw-Hill. The book covers the entire subject from basic hydraulics, mechanics and pneumatics to the design of systems; use of materials, equipment, and fittings; and methods of installation and repair.

Many advances are reflected in the new edition, including recent applications of hydraulics and pneumatics to the design of drainage pipes, traps, and vent pipes. New chapters have been added on hot water supplies and storage tanks.

The book makes exhaustive reference to the National Plumbing Code. Emphasis is given to the reasons behind good plumbing practices, rather than to unquestioning adherence to established rules.

Examples of trouble-shooting methods, installation mistakes to avoid, and other helpful pointers are included, along with a glossary of some 350 technical terms used in plumbing. In addition, there is an extensive list of standard specifications of plumbing materials, equipment, pipes, and fittings, together with 76 tables and accompanying illustrations showing weights, dimensions, and details. In all, there are 260 tables and 452 illustrations in the book.

In addition to being a consultant, Harold E. Babbitt is Professor Emeritus of Sanitary Engineering at the University of Illinois and Visiting Professor of Sanitary Engineering at Iowa State College. One of his noteworthy contributions was writing the State Plumbing Code for the Illinois State Board of Health.

Plumbing. By Harold E. Babbitt, Engineering Consultant. Third Edition, 642 pages, 6 x 9, 452 illustrations, 260 tables. McGraw-Hill Book Co., 327 W. 42nd St., New York 36, N. Y. Price, $13.50.

HOT WATER PANEL HEATING

Performance of Hot Water Panel Heating Systems, by Warren S. Harris, research professor of mechanical engineering, and Everett L. Sartain, former research associate in mechanical engineering, presents the results of tests made on floor panel and ceiling panel heating systems conducted by The Engineering Experiment Station

(Concluded on page 148)

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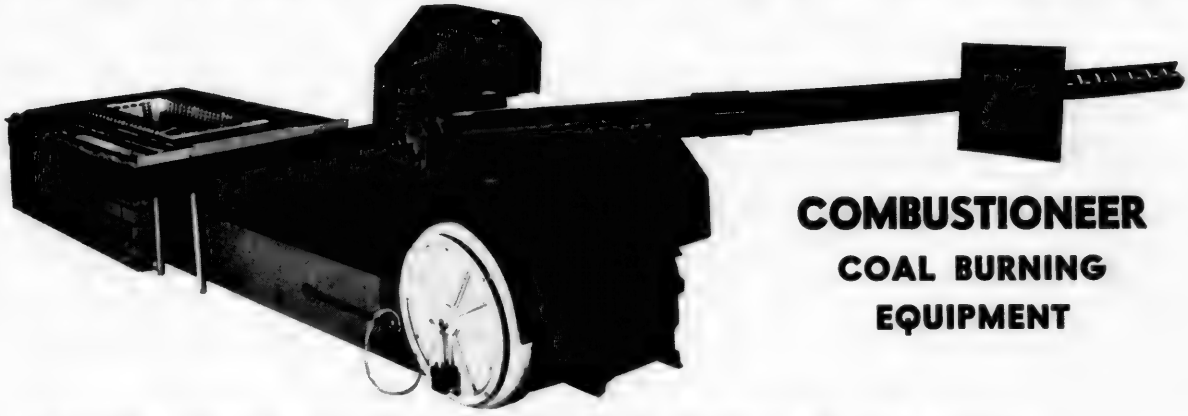

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(Concluded from page 147)

of the University of Illinois in cooperation with the Institute of Boiler and Radiator Manufacturers.

The systems were installed in the Floor Slab Laboratory at the University, and were designed to simulate current residential heating systems. Ceiling panels consisted of nominal ½-inch copper tube embedded in the plaster, and floor panels consisting of ¾-inch black iron pipe laid on 12-inch centers in a 5-inch concrete floor slab.

The report gives the resultant temperatures at different parts of the floor, floor-to-ceiling air temperature gradients, fuel consumption, and other engineering data for bare floor panels, floor panels covered with carpeting and covered with asphalt and rubber tile, and from ceiling panels.

University of Illinois Engineering Experiment Station Bulletin No. 453, in soft cardboard cover, 8½ x 11 inches, 61 pages. Published by Engineering Publications Office, 114 Civil Engineering Hall, University of Illinois, Urbana, Ill. Price is one dollar.

PRICE CORRECTION

In an earlier review of Pocket Manual on Heating published by Dunham-Bush, Inc., the price was given as $2.50 a copy. Information has since been received that the price is $1 a copy to those affiliated with the air conditioning, heating and ventilating industries.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

CORROSION ENGINEERS SHOW—Annual conference and corrosion show of the National Association of Corrosion Engineers, at the Dallas Memorial Auditorium, Dallas, Tex. Secretary of the Association, 1061 M & M Building, Houston 2, Tex. ..... **MARCH 14-18, 1960.**

FIRST NATIONAL ELECTRIC HOUSE HEATING EXPOSITION, sponsored by the National Electrical Manufacturers Association, at the Sherman Hotel, Chicago. R. D. Smith, secretary of the Association, 155 East 44th St., N. Y. 17, N. Y. ..... **MARCH 21-23, 1960.**

AMERICAN POWER CONFERENCE—22nd annual American Power Conference, sponsored by Illinois Institute of Technology, in cooperation with many technical societies and educational institutions, at the Hotel Sherman, Chicago, Ill. R. A. Budenholzer, conference director, Mechanical Engineering Department of the Institute, 3300 Federal St., Chicago 16, Ill. ..... **MARCH 29-31, 1960.**

GAMA MEETING—Annual Meeting of the Gas Appliance Manufacturers Association, at The Greenbrier, White Sulphur Springs, West Va. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **MARCH 30-APRIL 1, 1960.**

NUCLEAR CONGRESS—Sixth Nuclear Congress, sponsored by the Engineers Joint Council and the Instrument Society of America, to be held in New York City. Headquarters to be announced later. Director of Technical and Educational Services, ISA, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **APRIL 3-8, 1960.**

OHI EXPOSITION AND CONVENTION—23rd National Oil Heat and Air Conditioning Exposition, at the New York Coliseum, held concurrently with the 28th annual convention of OHI, at the Park-Sheraton Hotel, New York City. Secretary, Oil Heat Institute of America, Inc., 500 Fifth Ave., New York 36, N. Y. ..... **APRIL 4-7, 1960.**

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BRI SPRING CONFERENCES—Building Research Institute Spring Conferences at Statler Hilton Hotel, New York, N. Y. Harold Horowitz, Assistant Director for Technical Programs, Building Research Institute, 2101 Constitution Ave., Washington 25, D. C. ..... **APRIL 19-21, 1960.**

CSA MEETING—Spring meeting of Central Supply Association, at the Palmer House, Chicago. J. H. Peery, secretary of the Association, 221 N. LaSalle St., Chicago 1, Ill. ..... **APRIL 20-22, 1960.**

ASME-SAM CONFERENCE—ASME-SAM Management Conference, at the Statler Hilton Hotel, New York, N. Y. Secretary, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. ..... **APRIL 21-22, 1960.**

WELDING SOCIETY MEETING—41st Annual Meeting and Welding Exposition of the American Welding Society in Los Angeles Calif. Headquarters to be announced later. A. L. Phillips, secretary of the Society, 33 W. 39th St., New York 18, N. Y. ..... **APRIL 25-29, 1960**

WESTERN EXPOSITION—Third Western Air Conditioning, Heating, Ventilating and Refrigeration Exhibit and Conference, at Shrine Exposition Hall, Los Angeles, Calif. F. J. Tabery, exhibit manager, 3443 S. Hill St., Los Angeles 7, Calif. Exhibit sponsored by Western Air Conditioning Industries Association. ..... **APRIL 27-30, 1960.**

MECHANICAL CONTRACTORS MEETING—Annual meeting of the Mechanical Contractors Association of America, at the Hotel Waldorf-Astoria, New York City. T. J. Ryan, secretary of the Association, 45 Rockefeller Plaza, New York 20, N. Y. .. **MAY 9-12, 1960.**

METAL EXPOSITION & CONGRESS—2nd Southwestern Metal Exposition & Congress, at State Fair Park, Automobile Building, Dallas, Tex. C. L. Wells, exposition manager, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. .... **MAY 9-13, 1960.**

ISA CONFERENCE AND EXHIBIT—ISA Instrument-Automation Conference and Exhibit, at Brooks Hall, San Francisco, Calif. W. H. Kushnick, executive director of the Instrument Society of America 313 Sixth Ave., Pittsburgh 22, Pa. ..... **MAY 9-13, 1960.**

DESIGN ENGINEERING SHOW—ASME Design Engineering Conference and Show, at the Statler Hilton Hotel, New York, N. Y. Secretary, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. ..... **MAY 23-26, 1960.**

SAE MEETING—Summer meeting of the Society of Automotive Engineers, at the Edgewater Beach Hotel, Chicago, Ill. Secretary of the Society, 29 W. 39th St., New York, N. Y. ... **JUNE 5-10, 1960.**

I-B-R MEETING—Annual meeting of The Institute of Boiler and Radiator Manufacturers, at the Seaview Country Club, Absecon, N. J. Secretary of the Institute, 60 E. 42nd St., New York, N. Y. ..... **WEEK OF JUNE 6, 1960.**

NDHA MEETING—Annual meeting of the National District Heating Association, at Grove Park Inn, Asheville, N. C. Secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 6-9, 1960.**

ASHRAE MEETING—Annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., at Royal York Hotel, Vancouver, B. C., Canada. Secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **JUNE 13-15, 1960.**

ASTM MEETING—Annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 26-JULY 1, 1960.**

(Concluded on page 150)

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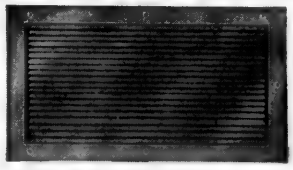

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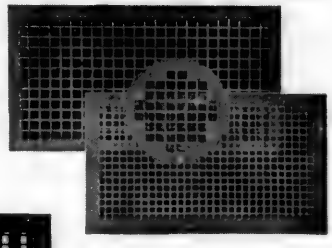

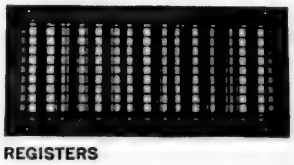

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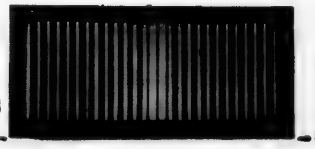

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CONGRESS ON OCCUPATIONAL HEALTH—13th International Congress on Occupational Health, at the Waldorf-Astoria Hotel, New York City. James W. Muckell, executive secretary, Room 415, 527 Madison Ave., New York 22, N. Y. .....**JULY 25-29, 1960.**

CRYOGENIC ENGINEERING CONFERENCE — 1960 Cryogenic Engineering Conference sponsored by the University of Colorado and the National Bureau of Standards at the University of Colorado, Boulder, Colo. K. D. Timmerhaus, secretary, Chemical Engineering Department of the University, Boulder, Colo. **AUGUST 23-25, 1960.**

ISA EXHIBIT AND MEETING—ISA Instrument-Automation Conference and Exhibit, in conjunction with the 15th annual meeting, at the Coliseum, New York, N. Y. W. H. Kushnick, executive director, Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa. .....**SEPTEMBER 26-30, 1960.**

Canadian Degree-Days for January, 1960*

City	January		Cumulative	
	1960	Normal	1959-60	Normal
Calgary, Alta.	1562	1530	5214	5190
Charlottetown, P. E. I.	1378	1460	4081	4310
Crescent Valley, B. C.	1412	1360	4898	4580
Edmonton, Alta.	1748	1780	5565	5850
Fort William, Ont.	1712	1830	5563	5790
Grande Prairie, Alta.	1736	1820	5754	6120
Halifax, N. S.	1212	1262	3473	3775
London, Ont.	1245	1320	3899	4000
Medicine Hat, Alta.	1682	1590	5060	5000
Moncton, N. B.	1436	1520	4327	4620
Montreal, P. Q.	1557	1590	4501	4630
North Bay, Ont.	1630	1710	5322	5330
Ottawa, Ont.	1589	1640	4747	4850
Penticton, B. C.	1185	1190	3934	3780
Prince George, B. C.	1569	1570	5303	5330
Quebec City, P. Q.	1653	1690	5071	5150
Regina, Sask.	1990	1940	6142	6090
St. John, N. B.	1416	1440	4250	4570
Saskatoon, Sask.	2042	1990	6173	6240
Timmins, Ont.	1779	1990	6102	6190
Toronto, Ont.	1209	1249	3647	3771
Vancouver, B. C.	884	890	3058	3010
Victoria, B. C.	779	800	2928	2770
Windsor, Ont.	1151	1220	3528	3660
Winnipeg, Man.	1948	1993	6026	6023

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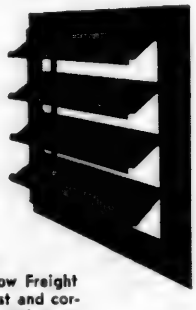

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SUMMER AIR CONDITIONING by S. Konzo, J. R. Carroll and H. D. Bariether. This basic what-how-and-why book on residential air conditioning is a training text and reference book for all who design, sell, install or operate air conditioning systems and equipment for houses and small buildings. It contains problems and exercises for each chapter which help check the reader's understanding of the material. All problems can be solved by the use of simple arithmetic. All industry methods, including those recommended by engineering and trade associations, have been taken into account. A psychrometric chart is provided. 560 pages, 266 illus., **$8.00.**

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HUGHES PRINTING CO.
EAST STROUDSBURG, PA.

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

ASME PRESSURE RELIEF VALVES ..... manufactured by Watts come in a very large selection. These T&P relief valves for hot water supply systems provide low cost protection. Series 740 are especially designed for space heating boilers. They have extremely high discharge capacities because of their large internal flow areas. Information available.
Inside Front Cover — Item 200

TRAPS ARE GUARANTEED ..... by Armstrong to satisfy. Your money back if not completely satisfied with the way they do their job. The 44-page Armstrong's steam trap book goes into great detail on all their features.
Page 1 — Item 201

INDIVIDUAL HEATING AND COOLING is offered by Warren Webster. The cost of a central system is eliminated on the cooling cycle. Complete system for heating and cooling built into each unit with individual controls for each room. Cooling unit by Chrysler Airtemp. A revolutionary development in air conditioning. Information available.
Page 2 — Item 202

NEW POWER ROOF EXHAUSTERS .... by Jenn-Air in Key Line. These centrifugal and axial units have the lowest contour of any spun aluminum unit with motor and drive out of the air stream. There are 70 models ranging from 725 to 27,000 cfm. Bulletins are available.
Page 5 — Item 203

DIAPHRAGM TYPE FLUSH VALVES ... manufactured by Coyne & Delany provide optimum performaance at minimum maintenance cost for many years. Superiority in design allows continuous on-the-job savings and continues to make this company's flush valves the fastest growing in the industry. Information available.
Page 7 — Item 204

SUPER-DRY REFRIGERANTS ..... produced by Genetron are preferred in laboratories, libraries and luxury liners because of their dependable performance, consistent high quality and maximum dryness and purity. Refrigerants-11, 12, 22, 113, and 114a. Information available.
Page 9 — Item 205

LONGER LENGTHS ..... of copper tube mean fewer joints. Anaconda copper tube for sanitary drainage systems comes in standard 20-ft lengths. Information is available.
Page 11 — Item 206

PNEUMATIC CONTROL EQUIPMENT .. produced by Johnson Service includes a line of thermostats for every purpose: Room thermostats; heating-cooling thermostats; insertion thermostats; immersion thermostats, etc., etc. Condensed catalog of all types of pneumatic control equipment available.
Pages 12-13 — Item 207

RADIATOR VALVES, TRAPS, VENTS .... available from Marsh for uniformly good heating performance. Valves are truly packless, not just called packless. Traps have the famous Marsh diaphragm, which is extremely rugged and sensitive. An up to date heating specialty catalog is offered.
Page 15 — Item 208

AIR CONDITIONING PRODUCTS ..... from American-Standard's Industrial Div. provides one-source responsibility. Air conditioning, air handling, heating, air pollution control, power transmission, and heat transfer products are all designed, engineered, and manufactured to work together. Information available.
Insert 17-20 — Item 210

COMFORT CONTROLS ..... offered by Powers Regulator provide individual comfort conditions for every room and various types of baths in Colorado's largest private general hospital: St. Mary-Corwin Hospital, Pueblo. No other single firm makes so many of the essential thermal comfort controls for modern hospitals as Powers. Information available.
Pages 22-23 — Item 211

COPPER TUBE BOILERS ..... offered by Bryan Steam are being installed in more and more hospitals for both space heating and water requirements. Dependable, efficient, and economical. Engineering specifications on boilers to fit every type installation available.
Page 24 — Item 212

DUAL-DUCT CONDITIONING ..... by Buensod-Stacey is an extremely efficient system for year-round comfort. Warm air in one duct, cool air in the other are combined in company's patented mixing unit in response to thermostat. Self-contained automatic volume control maintains air volume within plus or minus five percent. Complete story available.
Page 25 — Item 213

HEATING CONDENSATE PUMPS ..... by Skidmore include the easily accessible and compactly designed single unit with low inlet connection and quiet operation; and the very efficient vacuum pump, single unit which automatically adjusts itself to the varying conditions. Bulletins available.
Page 26 — Item 214

FIBER GLASS PIPE INSULATION ..... made by Pittsburgh Plate Glass Co. has high thermal efficiency, produces an attractive insulation, and will last a long time. A molded flexible hollow cylinder, it is slit along its length to provide quick application to pipes or tubing. Complete details available.
Page 27 — Item 215

FIRST UNIT OF ITS KIND ..... is the Patterson-Kelley indirect gas-fired storage water heater for commercial, industrial and institutional use. Has the finest controls and safeguards. Heat transfer occurs below the temperature at which minerals that cause scaling precipitate. Complete technical data offered.
Pages 28-29 — Item 216

PACKAGED H-P CONDITIONING ..... is offered by Westinghouse. Sectional design of air distributing units permits in-line installation for dual-duct and other high-velocity air conditioning systems. Installation costs are lower because of factory fabricated compact design. Pressures to 9 inches. Optional in-line electronic air cleaning. Information available.
Page 30 — Item 217

LARGE PACKAGE BOILER ..... made by The Babcock & Wilcox Co. is your best buy if your requirements are in the range of 50,000 to 100,000 lb per hr. This is not an enlargement of an existing product, but a completely new oil and gas-fired boiler. Information available.
Page 31 — Item 218

NEW TEMPERATURE CONTROL SYSTEM by Spence Engineering gives unusual control accuracy. Unique cascade-type control with throttling range adjustment independent of maximum heater pressure will tame wide ranging, fast changing loads of instantaneous heaters and modern heat exchangers. Bulletin explains.
Page 32 — Item 219

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

INDIVIDUAL ROOM CONDITIONERS .. from McQuay, Inc., utilize central station heating and cooling, and are efficient, versatile and dependable. Information is offered.
Page 33 Item 220

CENTRALIZED CONTROL ..... by Barber-Colman is explained in new bulletin which describes and illustrates centralized remote control center for air conditioning and explains the unique advantages of the company's Electronic control.
Pages 34-35 Item 221

CENTRIFUGAL PUMPS ..... of the single stage, horizontally split-case type, from Chicago Pump Co., feature heavy shafts, minimum space requirements, and excellent operating efficiencies. Engineering data are available.
Page 36 Item 222

CIRCULAR AIR-COOLED CONDENSERS trade named Fandaire by Aimco Products (subsidiary of Yuba) are faced right no matter what the wind direction. Low silhouette unit has high-heat dissipating fintube. Weighs 1/3 less than conventional installation. Savings in piping and installation alone may be considerable. From 3 to 120 tons per unit. Information available.
Page 37 Item 223

BOILER-BURNER UNIT ..... by Weil-McLain provides dependable heating for the Wilbraham Motel, Boston Road, Wilbraham, Mass. The rugged, cast-iron boiler assures efficient combustion of fuel and absorption of heat. Number 82 boilers are available as B units furnished with burner, combustion chamber and controls, or as A units with combustion chamber and flange-mounted base front only, and as O unit with rectangular opening in base front and no burner or combustion chamber. Bulletin explains.
Page 40 Item 224

REFRIGERATION SPECIALTIES ..... are detailed in Sporlan catalog describing the first molded porous core filter dryer, the first combination moisture and liquid indicator, solenoid valves with layer wound coil, thermostatic expansion valves with the original FlowMaster element, and distributors with versatile interchangeable nozzles.
Page 41 Item 225

GAS-OPERATED ABSORPTION ..... provides trouble-free, economical cooling at U. S. Air Force Academy. Carrier machine operates without noise and vibration. With gas as the boiler fuel, operating costs are cut to a minimum. Information is available.
Pages 42-43 Item 226

GUARANTEED VALVES ..... manufactured by Jenkins, if put on the worst place you can find in a service for which the valve is recommended, will hold steam, oil, acids, water or other fluids perfectly tight and longer than any other valve. If not, your money will be refunded. Information available.
Page 44 Item 227

TWIN-SYSTEM HEAT PUMP ..... by York for central heating and cooling means two separate cooling systems plus two separate heating systems. One operates under normal conditions; the second goes into action automatically under extreme conditions. The user pays only for the cooling or heating he needs. Full details available.
Page 45 Item 228

REFRIGERATION CONTROLS ..... by Alco Valve Co. are engineered to retain your product leadership. Contour power assembly increases power elements life as much as ten times. Rapid response remote bulb and well cuts danger of flood back, has very quick closing response, and provides more efficient control over a wider range of operating conditions. Bulletin explains.
Page 46 Item 229

COOLING TOWERS ..... by Halstead & Mitchell cut costs by packaging. These 150-ton packages are used together in any multiple for inexpensive installation and lowered operating costs because of step-control. Like all H&M towers these units carry 20-year guarantee on wetted deck against failure due to fungus attack or rotting. Information available.
Page 47 Item 230

ABSORPTION WATER CHILLER ..... offered by Trane is a hermetic unit for low-cost industrial water chilling. Advance hermetic design, single-shell construction, provide simplified installation, minimum maintenance, economical operation for process or comfort cooling. Information available.
Pages 48-49 Item 231

FLUSH VALVES ..... manufactured by Sloan save water. Since water is scarce in many parts of the country, you save both water and money when you specify these units. Two water-saving features: non-hold open, which prevents accidental or malicious waste of water, and no regulation, which means there is no regulating screw to get out of adjustment. Information available.
Page 50 Item 232

SCHOOL HEATING, VENTILATING .... for Holy Family elementary school, Fulton, N. Y., cost $1.36 per sq ft, compared to 23,520 sq ft gross building area cost of $11.59 per sq ft. This figure represents considerably lower installation expense and amounts to a sizable saving on the aggregate. System installed was Dunham-Bush's Vari-Air System. Information available.
Page 51 Item 233

DUCT-MOUNTED FANS ..... make fume removal an inside job. Space saving DeBothezat units provide efficient direct drive power. Information is available.
Page 52 Item 234

WASHFOUNTAINS ..... made by Bradley are widely used in schools of every size. These group type, foot-controlled wash fixtures provide economy and ultra-sanitary features. No faucets to manipulate or maintain, no chance of collection of contaminating water in the bowl since it is self-rinsing. New catalog offered.
Page 53 Item 235

STEEL PIPE ..... is available from U. S. Steel for power, heating, and air conditioning installations. You get a quality pipe when you specify USS National Steel Pipe. Information available.
Page 54 Item 236

THERMOSTATIC CONTROL VALVES .. manufactured by Lawler are the industry's most advanced and consistent. "Years ahead" design reflects experience over the greater part of a half-century solving difficult control problems. Information on thermostatic control valves offered.
Page 56 Item 237

COST-CUTTING PIPE INSULATION .... offered by Gustin-Bacon is called Snap-On. Easily installs around obstructions because it is made of easily cut molded glass fibers, so can be tailor-cut to fit snugly and neatly around runouts, feeders, valves, fittings, etc. In sizes from copper tubing to 36-inch IPS. Information available.
Page 57 Item 238

PACKAGED BOILERS ..... offered by Iron Fireman. Fred Reidel, chief engineer, Mid-Island Hospital, Bethpage, L. I., states "The old fashioned way of installing boilers required separate estimates for burners, steel front plate, brick combustion chamber, oil heating equipment and wiring. Everything was assembled at the site. Now the finished unit is simply lowered into place and bolted down." Complete technical descriptions and specifications for oil, gas or oil-gas combination firing available.
Page 117 Item 239

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. All advertisements are digested here except those that are received too late for inclusion in this listing.

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

HIGH PRESSURE UNITS ..... by Drayer-Hanson are used to air condition 400,000 sq ft of 27-story Kroger Building in Cincinnati. Twenty-four pace-setting new high pressure H.C.D. air handlers do it. Literature available.
Page 118 Item 240

SCOTCH-TYPE BOILERS ..... available from Burnham Corp. come in stock sizes from 2930 to 39,370 sq ft net EDR steam, new SBI ratings, or net steam or water 702 MBh to 9450 MBh. A perfectly matched combination of boiler and burner for light or heavy oil, or oil-gas combination. Full ratings and data available.
Page 119 Item 241

FILTER BULLETINS ..... describe the various Airsan air filters which perform the specific duty for which they are designed: Low velocity filters, high velocity filters and grease filters.
Page 120 Item 271

UNIVERSAL PUMPS AND BOOSTERS .. manufactured by Bell & Gossett provide the necessary circulating equipment for the world's third largest heat pump installation at Washington Water Power Building, Spokane, Wash. System employs primary and secondary method of pumping developed by B & G engineers that materially reduces required pump horsepower and provides close temperature control. Booklet on pumping system offered.
Page 121 Item 242

BOILER WATER LEVEL CONTROLS .... by Magnetrol offer low-maintenance boiler safety. All you have to do to keep them in safe shape is to blow-down the float chamber once a shift, inspect the switches once a month. Catalog available.
Page 122 Item 243

NO THERMAL SHOCK ..... with Powermaster hot water boilers because (1) top inlet with specially designed internal distributor directs incoming water down around sides of boiler, (2) internal distribution prevents direct flow of return water against heating surfaces, (3) outlet is of dip tube design located at top of boiler, and (4) temperature gradients are kept low. Bulletin offered.
Page 123 Item 244

AIR FLOW SYSTEM ..... can be balanced once and for all times with the Alnor Velometer. There are no call backs to correct hot or cold spots. Bulletin is offered.
Page 124 Item 245

NEW ALL-IN-ONE BURNER ..... offered by Petro bolts to boiler front with an average installation saving in firebox boilers of $250. Also available as boiler-burner unit. No high stack needed. Switches fuels instantly. Cuts fuel costs. Capacities to 30 gph and 4 million Btuh. Information available.
Page 125 Item 246

INSULATION ADHESIVE ..... as well as Weathercoat, Mastic Weathercoat, and Floor Mastic Binder are offered under the Laykold label by American Bitumuls & Asphalt Co. Laykold asphalts have a history of performance in the cold-storage construction field. See ad for diagram showing best way to handle typical cold-storage construction. Information is available.
Page 126 Item 247

OHI CONVENTION ..... at Park-Sheraton Hotel, April 4, 5, 6 and 7 will be held in conjunction with the 23rd Oil Heat and Air Conditioning Exposition at the New York City Coliseum from 1 to 9 P.M. during the same period. A treasure house of new ideas and new equipment. Information on reservations available.
Page 127 Item 248

HIGH TEMPERATURE WATER ..... generators from International-LaMont have unequalled acceptance. More than 130 units already in operation have a total capacity exceeding three billion Btu per hr. Bulletins are available.
Page 128 Item 249

AIR CONDITIONING EQUIPMENT ..... which bears the Seal of Certification of Air-Conditioning and Refrigeration Institute can be specified with confidence. The seal appears only on equipment meeting industry-approved performance standards. Free explanatory booklet and directory of participating manufacturers offered.
Page 129 Item 250

RUGGEDLY-BUILT COILS ..... in the Bohn line are chosen because they are tested and rated according to ASRE-ASHAE Standard 33-58. Coils have die-formed plate-type aluminum fins, from 4 to 14 per inch, with self-spacing collars completely covering the tubes. Information available.
Page 130 Item 251

FLEXIBLE UNITS ..... from Typhoon allowed engineers to design space saving air conditioning installations in new Jewel Food Supermarkets. Company offers a reference chart which shows broad equipment line.
Page 131 Item 252

FLEXIBLE HOSE, RETRACTABLE DUCT offered by Flexaust have lowered installation costs in thousands of successful jobs. Other advantages include: exceptional abrasion resistance; corrosion resistance; noise absorption; provision for expansion and contraction. Full details available.
Page 132 Item 253

HIGH EFFICIENCY PUMPS ..... in the Taco LP line maintain their high overall efficiency throughout their entire useable range. Complete selection of sizes available gives complete coverage and permits each pump to be precisely tailored to the installation. Company manufactures a complete line of smaller pumps and circulators for air conditioning and heating installations. Information available.
Page 133 Item 254

TWO NEW SUBMERSIBLE PUMPS ..... offered by Kenco. A 3-phase, 230-volt industrial pump is of rugged cast-bronze with 5000 gph at 10-ft head. Fully automatic, complete with external liquid level control and motor starting. Another unit is offered to remove measured amounts of fluid automatically determined by the height at which the hi-turn-on control is set. Information is available.
Page 134 Item 255

FAST, EASY, WAY TO SEAL DUCTS ... is by using Arno Ductape. It is self-adhesive, requires no mixing, is vapor proof, stops air leaks at all joints, and is available in flame-resistant type. Free test sample offered.
Page 135 Item 256

ENGINEERS WANTED ..... by Haloid Xerox, Inc., Rochester, N. Y.: An air conditioning engineer, BSME, with at least six years' experience, and a project engineer (plant engineering) with experience in design, selection, installation, and servicing of industrial processes in mechanical equipment. See advertisement for details and reply directly to advertiser.
Page 135

COOLING EQUIPMENT ..... offered by the 107-year old Frick Co., with 55 years of experience in air conditioning, include heavy-duty compressors, evaporative condensers, and the Eclipse compressors, all described in bulletins available.
Page 135 Item 257

NEW BLOWER CATALOG ..... offered by Peerless Electric Division is a complete buyer's guide to the company's non-overloading electric blowers covering sizes from 12¼ to 89-inch wheel diameters. Contains full performance tables, specifications, selection and application data.
Page 136 Item 258

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

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LOW COST AIR CLEANER ..... produced by Mamco Corp. offers you the chance to get into a huge, rich market ahead of competition. Every home is a prospect for a Health-Air unit. Three-stage unit includes mechanical filter, electrostatic filter, and charcoal filter. Information available.
Page 137 Item 259

ELECTRIC STEAM BOILERS ..... are manufactured by P. M. Lattner Mfg. Co. in ten sizes. Of ASME construction, the units have highly sensitive adjusting controls. Information is available.
Page 137 Item 260

MOTORIZED ZONE CONTROL VALVE .. offered by Edwards Engineering Corp. is a low-cost unit perfectly fitted for hot water or steam systems. A free 70-page design handbook on single and multi-zone hot water baseboard heating systems is offered.
Page 137 Item 261

SPUN ALUMINUM VENTILATORS ..... are offered by The Burt Mfg. Co. in both direct drive and V-belt drive units. A databook which is available describes the company's complete line of modern roof ventilators.
Page 138 Item 262

FREEZE-PROOF STEAM TRAP ..... called the Anderson Quik-Flex, is ideal for tracer lines, meter boxes, drips and other outdoor steam processing equipment used in chemical, refinery, solvent and other industrial plants. Bulletin available.
Page 139 Item 263

FOR ZONE HEATING ..... on steam and hot water systems, only Zonvalve, by Heat-Timer Corp., has 7 important features listed in ad. Brochure is offered.
Page 140 Item 264

CONDENSATE DISPOSAL PUMPS ..... by March, in a complete line of low-cost units are designed for air conditioning and refrigeration. All pumps furnished with 110/220 volt motors, factory tested and ready to run. Bulletins offered.
Page 141 Item 265

LOW PROFILE ROOF FAN ..... by Davidson has new and streamlined design for today's modern flat roof structures. As much as 40% lower than conventional types. Capacities to 50,000 cfm. Information available.
Page 141 Item 266

AIR FILTER INSTITUTE ..... lists its members, from whom you can buy air filters with confidence. Information available.
Page 141 Item 276

NEW TRIANGLE VALVE ..... by U. S. Valve & Engineering Co. is a combination of two precision-engineered butterfly valves in a flanged T. Gives perfect flow control in cooling water systems where two streams flow to or from a single pipe. Information available.
Page 142 Item 267

EXPANSION JOINTS ..... from Yarnall-Waring Co. may be serviced in the line under full steam pressure. Costly shutdowns are eliminated. Fewer expansion joints needed. Low maintenance. New catalog available.
Page 142 Item 268

SPACE-SAVING CHILLER ..... by Vilter is especially suited for air conditioning applications, though it is readily adaptable to almost any liquid chilling system. Four standard sizes: 25, 50, 75, and 100-ton nominal capacities. Flooded-type shell and tube cooler and the condenser are mounted above a rugged compressor. Shipped with all wiring, insulation, refrigerant. Full details and application recommendations offered.
Page 143 Item 269

AIR DISTRIBUTION CATALOGS ..... offered by Anemostat are said to be the most valuable, most comprehensive set ever published. Each contains complete application and performance data. To get the ones you want use the advertisement in this issue.
Page 143

INDUSTRIAL VENTILATION MANUAL .. in its sixth official edition, is available for $4, hard back copies $7, from the Committee on Industrial Ventilation. Hundreds of diagrams, scores of ventilation tables and charts. Contains all information needed for the design of complete industrial ventilation systems. Order form in advertisement may be used. For more information on the book use inquiry card.
Page 144 Item 270

LINE TAP VALVES ..... from Watsco, Inc., have inexpensive ports for charging, discharging and testing. Illustrated brochure is offered.
Page 146 Item 272

LIFE-TIME SEALING COMPOUND ..... made by John Crane is a sure cure for leaky joints. Why waste time and money on inferior compounds when one application of PLS seals for the life of the connection? Free sample offered.
Page 146 Item 273

UNIVERSAL BIN FEED STOKER ..... manufactured by Automatic Solid Fuels Equipment, Inc., is a new concept in equipment offering greater flexibility of arrangement in new or existing boiler room design. A unit is available for all domestic, commercial and industrial applications. Complete data available.
Page 147 Item 274

MORE HOT WATER ..... can be had, and faster, too, with a Ewing automatic heavy-duty vertical hot water heater. And for less cost because it requires no expensive storage boilers, is simple and easy to install and operate, requires no maintenance, and saves valuable floor space. Up to 850 gph at 100-deg rise. Information available.
Page 148 Item 275

REGISTER AND GRILLE CATALOG .... details the entire line of Agitair units. A wide range of sizes and styles meets every requirement of the architect and designer. Available in aluminum, stainless, bronze, brass, standard steel and plated finishes.
Page 149 Item 277

EXTRUDED ALUMINUM SHUTTERS .... from Elgo Shutter & Mfg. Co. are of modern design, light weight, fully weather-stripped, easier to install, and are rust and corrosion proof. Complete specifications are available.
Page 150 Item 278

8-BLADE TUBEAXIAL FANS ..... produced by Aerovent offer top performance against medium pressures at speeds to 3450 rpm. Available in 16-, 18-, 24-, and 30-inch diameters. Combines speed, stamina, modern functional design. Bulletin available.
Page 150 Item 279

FLEXIBLE AIR DUCT ..... by Wiremold, unlike any other duct, mechanically locks to the fabric making it cuffless and always ready to hook up, simply by sliding it over the end fitting. Fastens with a sheet metal screw. Saves time and money on every connection. New folder offered.
Page 151 Item 280

REFRIGERATION SPECIALTIES ..... manufactured by Henry Valve Co. include moisture-liquid indicators, molded core filter-driers, diaphragm packless valves, packless and packed shut-off valves, all in various sizes and styles. Information available.
Inside Back Cover Item 281

FLOW SWITCHES ..... manufactured by McDonnell & Miller are compact, well built mechanisms that either make or break circuits, as required, when liquid flows or stops flowing. The most economical way of starting or stopping a signal, alarm, motor, metering device, or anything electrically operated. Bulletin explains.
Back Cover Item 282

CIRCLE FOR NEW EQUIPMENT AND LITERATURE INQUIRIES

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PLEASE PRINT CLEARLY

Name .....

Title or Job Function .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....Zone ....State .....

TO ORDER BOOKS DESCRIBED BELOW

Please send and bill me for the books circled: March '60

A B C D E F G H I J K L M N O P Q R S T U V

FIRST CLASS
PERMIT NO. 53
NEW YORK, N. Y.

BUSINESS REPLY CARD
NO POSTAGE NECESSARY IF MAILED IN UNITED STATES

POSTAGE WILL BE PAID BY

AIR CONDITIONING, HEATING and VENTILATING
93 WORTH STREET
NEW YORK 13, N. Y.

READERS SERVICE DEPT.

This service is not available to overseas readers. Cards are void after June 1, 1960.

BOOKS TO HELP YOU WITH YOUR DESIGN PROBLEMS

DESIGN OF AIR CONDITIONING SYSTEMS
by F. W. Hutchinson

115 full-page charts solve problems of air conditioning system design involving cooling load, duct design, psychrometrics, solar energy, comfort conditioning, panel cooling, etc. For each chart the engineering and mathematical background plus design example and solution are given. **336 Pages, 118 Illus., $7.00.**

TO ORDER CIRCLE B ON CARD ABOVE

DESIGN OF HEATING AND VENTILATING SYSTEMS by F. W. Hutchinson

96 full-page charts solve problems of heating and ventilating involving load determination, duct design, panel heating, solar heating and combustion analysis. Companion book to Design of Air Conditioning Systems. Same methods to explain and solve problems are used. **320 Pages, 96 Charts, $7.00.**

TO ORDER CIRCLE C ON CARD ABOVE

COMBINATION OFFER

Both of the above books by Prof. F. W. Hutchinson, $12.50.

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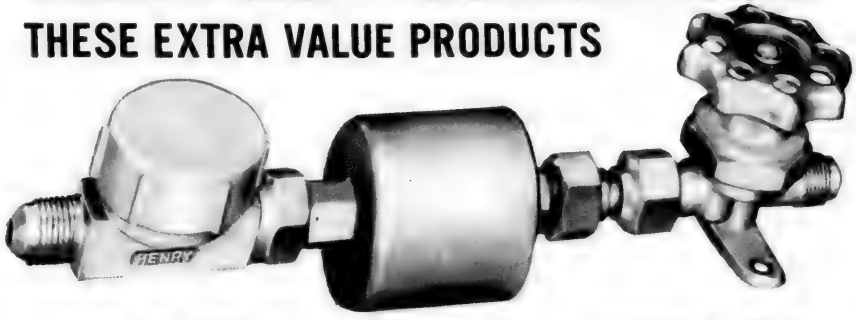

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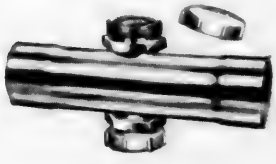

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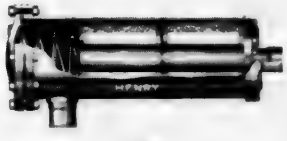

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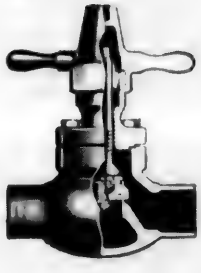

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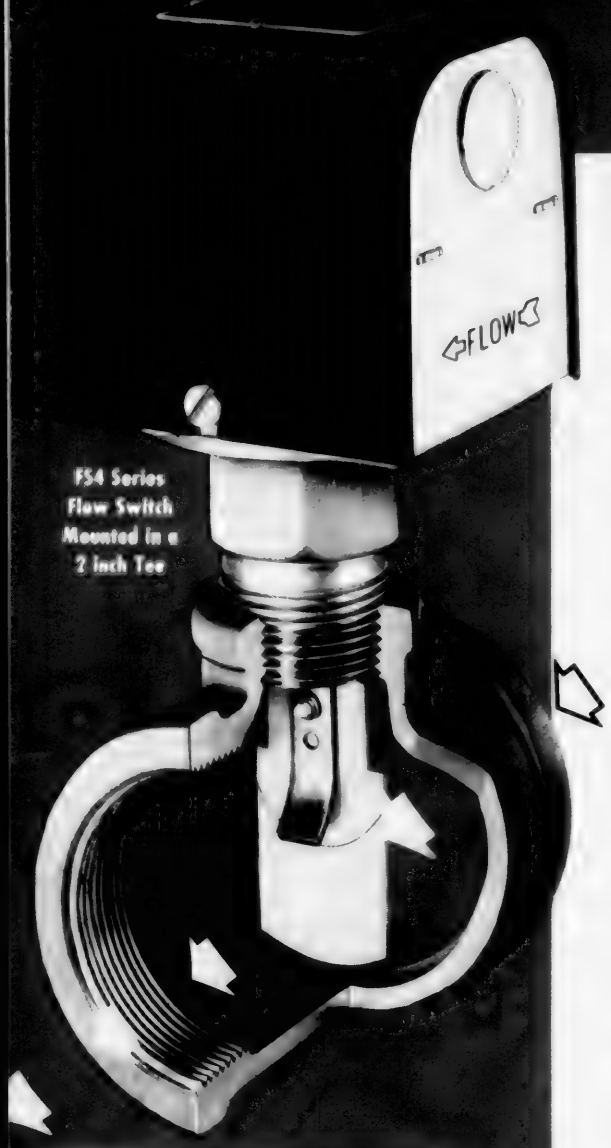

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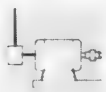
to actuate a signal light—signal an attendant to make the right moves in operating valves, pumps and the like—signal him when flow stops in a water cooled compressor, water cooled bearing and so on.

to sound an alarm—when flow stops in a process system or in any water cooled devices.



to start or stop motors—start pumps in sequence in multiple stage flow systems; start standby pumps; stop automatically controlled units if cooling water system fails; stop compressors in cooling systems when flow stops. These are *control* functions, and almost endless.

to start or stop automatic burner—start a booster heater when water draw occurs; stop burner if flow is improperly retarded; make sure of circulation in a boiler before burner is permitted to start.

to actuate metering device—open valve in chemical feeder line; start mixing in secondary line whenever flow starts in primary line.

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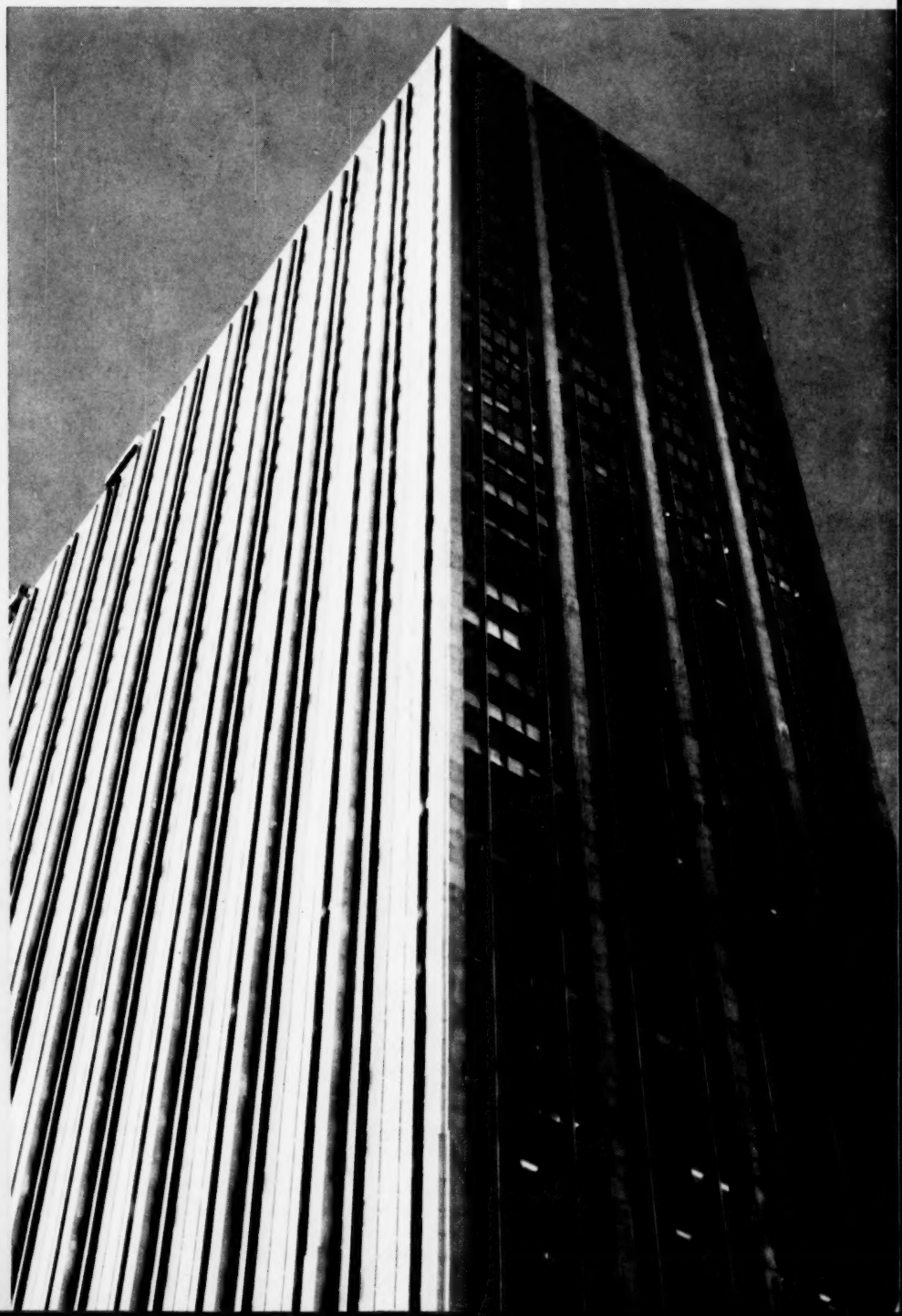

Vertical aluminum mullions enclose ducts for the air conditioning system serving the periphery of the 48-story Time & Life Building, New York City. For details see page 96. Photo, courtesy of National Insulation Manufacturers Association.

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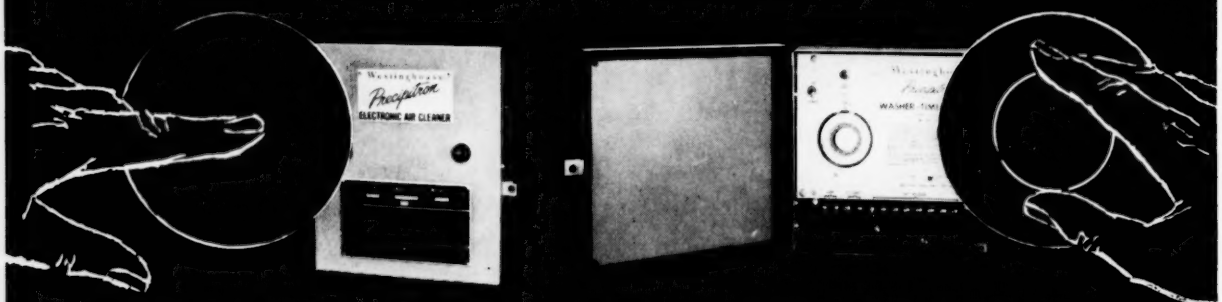

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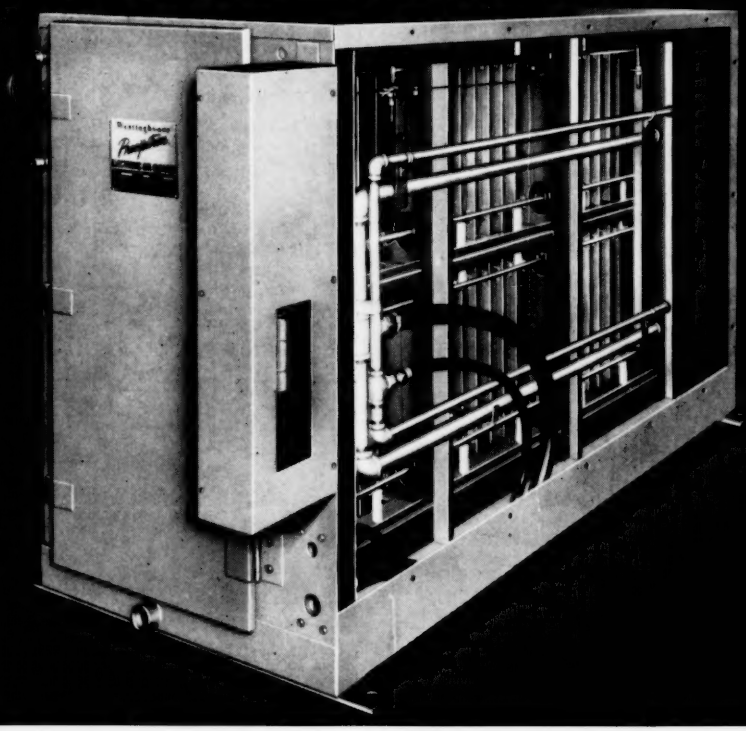

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Some Straight Talk On Steam Trap Capacity

...or pulling away the curtain of confusion that surrounds steam trap capacity ratings.

Unfortunately, for the steam trap buyer, the subject of steam trap capacity has become cloudy and confused by a landslide of claims, counter-claims and inconsistent "standards" for measurement. So let's take a cold hard look at this subject so vital to the efficient operation of your plant.

What Determines Steam Trap Capacity?

There are three factors that determine the capacity of a steam trap:

1. The area of the orifice.
2. The density of the condensate.
3. The pressure differential across the trap.

Let's take a closer look at each of these:

Area of orifice is usually specified by the trap manufacturer or can be calculated from the diameter. Nothing complicated here.

Density of condensate depends on temperature. A cubic foot of cold water weighs 62.4 lbs. At 250° F. or 15 psi, it weighs less than 59 lbs. This is important. Don't overlook it.

Pressure differential across the trap is most significant. And it is complicated by the many factors that affect it, such as:

1. Pressure drop between unit drained and the trap when the trap valve is open.
2. Distance the trap valve is moved from the valve seat.
3. Back pressure on the trap with orifice closed; i.e., return header pressure.
4. Increase in back pressure produced by condensate and flash steam flowing in the discharge line. This in turn is affected by the diameter and length of the discharge line, plus friction caused by valves and fittings.

Orifice Capacity Vs. Steam Trap Capacity

Figure 1 shows a ½" diameter sharp-edged orifice at the end of a pipe filled with cold water at 15 lbs. pressure. The capacity of this orifice, using a .61 coefficient of flow would be 8,800 lbs. per hr. Now, would this ½" orifice if used in a ¾" steam trap installed as shown in Figure 2 provide the trap with a continuous discharge capacity of 8,800 lbs. of hot condensate per hour? The answer is "no". And here are some of the reasons why:

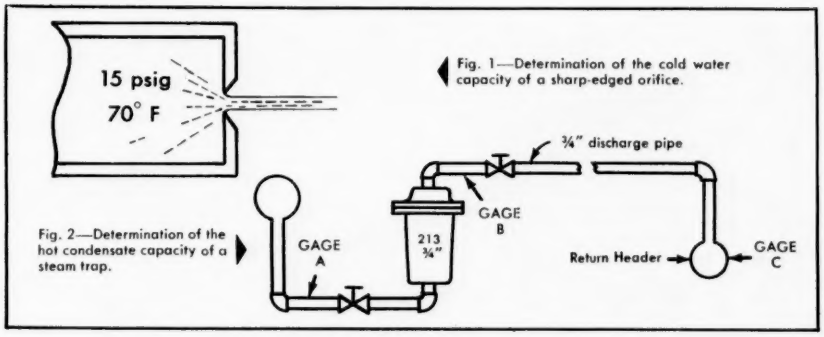

Fig. 1—Determination of the cold water capacity of a sharp-edged orifice.

Fig. 2—Determination of the hot condensate capacity of a steam trap.

Density of condensate. As pointed out above, cold water weighs 62.4 lbs. per cu. ft. At 15 lbs. pressure and 250° F. water weighs less than 59 lbs. per cu. ft. This difference in density alone reduces the lbs. per hour capacity of the orifice by over 5%.

Pressure differential across the trap. With the trap valve closed we have a static pressure differential of 15 psi. The trap valve must be able to open against this pressure. However, this is not the pressure differential that will determine the capacity of the trap valve.

The ¾" discharge line will be full of a mixture of flash steam and condensate. To keep this mixture flowing from the trap outlet to the return line requires a pressure differential. In actual capacity tests run as shown in Figure 2 Gage B at the trap outlet registered 11 lbs. back pressure. Thus the true pressure differential across the trap was about 4 lbs. Under these conditions the measured capacity of the trap was 4,340 lbs/hr. or just about half of the capacity of the ½" orifice for cold water.

How Armstrong Determines Capacity Ratings

Armstrong trap capacity ratings are based on hundreds of tests under actual operating conditions. In these tests, the condensate used was at the steam temperature corresponding to the test pressure. Thus, the capacities determined take into account the pressure drop that occurs when the trap orifice opens and the choking effect and back pressure of the flash steam. Actual installation hook-ups were used so that pipe friction in both inlet and discharge lines as well was reflected in the results.

Let's go back to the example cited above and in Figure 2. The trap referred to is an Armstrong No. 213. While it did test out at 4,340 lbs. per hour for a static pressure differential of 15 psi, it is rated in the catalog at only 3900 lbs. per hour for this pressure—just to be on the safe side.

For the trap buyer, this means that Armstrong Steam Trap capacities are based on handling condensate at steam temperature for the stated static steam pressure differential under actual working conditions.

Capacity ratings which don't take into account all of the variables will be misleading and may lead to the selection of undersized traps. So whenever you specify or buy traps be sure that the capacity ratings you work from are realistic. One way to be sure is to select Armstrong Traps with *guaranteed* capacity ratings.

* * *

Additional information on trap capacity ratings, plus data on how to correctly size, install and maintain steam traps for any pressure, any temperature and any load, are presented in the 48-page Armstrong Steam Trap Book. Ask your local Armstrong Representative for a copy or write:

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